

**TWIN DISC
INCORPORATED**



Service Manual

Marine Transmission

Components:
MG-5506

Document Number: 1021568

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Marine Transmission Service Manual



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 3. The warranty is void if any modifications are made to any product or part without the prior written consent of Twin Disc, Incorporated.
 4. The warranty is void unless the product or part is properly transported, stored and cared for from the date of shipment to the date placed in service.
 5. The warranty is void unless the product or part is properly installed and maintained within the rated capacity of the product or part with installations properly engineered and in accordance with the practices, methods and instructions approved or provided by Twin Disc, Incorporated.
 6. The warranty is void unless all required replacement parts or products are of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Replacement parts or products not of Twin Disc origin are not warranted by Twin Disc, Incorporated.
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- D. Only a Twin Disc, Incorporated authorized factory representative shall have authority to assume any cost or expense in the service, repair or replacement of any part or product within the warranty period, except when such cost or expense is authorized in advance in writing by Twin Disc, Incorporated.
- E. Twin Disc, Incorporated reserves the right to improve the product through changes in design or materials without being obligated to incorporate such changes in products of prior manufacture. The original customer and subsequent purchasers will not use any such changes as evidence of insufficiency or inadequacy of prior designs or materials.
- F. If failure occurs within the warranty period, and constitutes a breach of warranty, repair or replacement parts will be furnished on a no charge basis and these parts will be covered by the remainder of the unexpired warranty which remains in effect on the complete unit.



TWIN DISC, INCORPORATED **FLAT RATE HOUR ALLOWANCE** **COMMERCIAL MARINE TRANSMISSION**

(Hourly Labor Rate Must be Acceptable to Twin Disc, Incorporated.)

COMMERCIAL MARINE TRANSMISSIONS ALL RATIOS:

MODEL SERIES	R&R	UNIT REBUILD	CLUTCH REPAIR (BOTH PACKS)
• MG502, MG5005, MG5010, MG5011, MG5012, MG5015, MG5020.....	10.0	8.0	-
• MG506, MG5061, MG5062, MG5065, MG5050, MG5055.....	10.0	11.0	-
• MG507, MG5081, MG5085, MG5090 MG5075, MG5091.....	10.0	12.0	-
• MG5112, MG5113, MG5085, MG5090, MG509, MG 5111, MG5114, MGX5114.....	10.0	17.0	-
• MG514C, MG514M, MG5141, MG514CHP MGX5135, MGX5145, MGX5147.....	10.0	25.0	6.0
• MG516, MG5161, MG5170.....	10.0	28.0	8.0
• MG518-1.....	10.0	32.0	10.0
• MG520-1, MG 5202, MG5203, MG5204, MG5205, MG6449, MG6557.....	10.0	32.0	10.0
• MG530, MG530M, MG5301, MG6650, MG6690, MG6848, MG6598, MG6600, MG6619, MG6620, MG6984, MG61242, MGX6650, MGX6690, MGX6848.....	12.0	32.0	16.0
• MG540, MG5506, MG5600.....	20.0	62.0	20.0
• MGN80, MGN232, MGN233, MGN272, MGN273, MGN332, MGN334, MGN335, MGN432, MGN433, MGN472, MGN493.....	10.0	32.0	10.0
• MGN650, MGN800, MGN1000, MGN1400, MGN1600.....	20.0	62.0	40.0
• PUMP (ALL MODELS).....	1.0	-	
• VALVE (ALL MODELS).....	1.0	.5	

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Introduction

General Information

This publication provides service information for the Twin Disc MG-5506 marine transmission. Specific engineering details and performance characteristics can be obtained from the Product Service Department of Twin Disc, Incorporated, Racine, Wisconsin, USA.

Operation and maintenance personnel responsible for this equipment should be familiar with this publication and have it at their disposal. A thorough understanding and application of the material in this manual will result in consistent performance from the unit and help reduce downtime.

Safety and General Precautions

General

All personnel servicing this equipment should employ safe operating practices. Twin Disc, Inc. will not be responsible for personal injury resulting from careless use of hand tools, lifting equipment, power tools, or unacceptable maintenance/working practices.

Important Safety Notice

Proper installation, maintenance, and operation procedures must be followed due to the possible danger to person(s) or property from accidents that may result from the use of machinery. Twin Disc, Inc. will not be responsible for personal injury resulting from careless maintenance/working practices.

Inspect as necessary to assure safe operations under prevailing conditions. Proper guards and other safety devices that may be specified in safety codes should be provided. These devices are neither provided by, nor are they the responsibility of Twin Disc, Inc.

WARNING

Selecting **NEUTRAL** disengages transmission clutches but does not prevent propeller shaft rotation. If you require positive neutral (propeller shaft locked), a shaft brake or other shaft-locking device must be used.

WARNING

To prevent accidental starting of the engine when performing routine transmission maintenance, disconnect the battery cables from the battery and remove ignition key from the switch.

WARNING

Most Twin Disc products have provisions for attaching lifting bolts. The holes provided are always of adequate size and number to safely lift the Twin Disc product. These lifting points must not be used to lift the complete power unit. Lifting excessive loads at these points could cause failure at the lift point (or points) and result in damage or personal injury.

CAUTION

Select lifting eyebolts to obtain maximum thread engagement with bolt shoulder tight against housing. Bolts should be near but should not contact bottom of bolt hole.

Preventative Maintenance

The Preventative Maintenance section of this manual provides schedules for recommended maintenance of the equipment.

Towing

WARNING

Under the conditions described below, the propeller shaft must be locked in place to prevent backdriving, or an optional trailing pump must be added. Failure to do this can damage the marine transmission due to the lack of component lubrication.

Backdriving (also called windmilling) occurs when an engine is shut down and the propeller shaft is being driven by the flow of water across the propeller, which, in turn, rotates the components in the marine transmission. During backdriving conditions, the transmission does not receive proper lubrication.

Conditions where backdriving may occur:

- ☐ Vessel is being towed.
- ☐ One or more engines on a multiple-transmission vessel are shut down while under way.
- ☐ Sailboat under sail with auxiliary engine shut down.
- ☐ Vessel tied up or docked in a heavy current.

The following solutions are applicable for all MG-5506 transmissions when any of the above conditions are present:

- ☐ Lock the propeller shaft to prevent rotation.
- ☐ Add an optional trailing oil pump into the lubrication circuit.

Refer to the hydraulic system schematics for more details on the optional trailing pump specifications for the applicable transmission, or contact your Twin Disc Authorized Distributor.

Ordering Parts and Obtaining Services

WARNING

All replacement parts or products (including hoses and fittings) must be of Twin Disc origin or equal, and otherwise identical with components of the original equipment. Use of any other parts or products will void the warranty and may result in malfunction or accident, causing injury to personnel and/or serious damage to the equipment.

Ordering Service Parts

Renewal parts, service parts kits, optional equipment and product service assistance may be obtained from any authorized Twin Disc distributor or service dealer. Contact Twin Disc for the distributor or service dealer near you.

Note: Do not order parts using the part numbers on the cross-sectional drawings. These numbers may be referenced for part identification; however, they should be verified on the bill of material (BOM) before an order is placed. BOM numbers are stamped on the unit nameplate.

Twin Disc, having stipulated the bill of material number on the unit's nameplate, absolves itself of any responsibility resulting from any external, internal, or installation changes made in the field without the express written approval of Twin Disc. All returned parts, new or old, resulting from any of the above stated changes will not be accepted for credit. Furthermore, any equipment that has been subjected to such changes will not be covered by a Twin Disc warranty.

Source of Service Information

For the latest service information on Twin Disc products, contact any Twin Disc distributor or service dealer. This can be done on the Twin Disc corporate web site found at [<http://www.twindisc.com>]. Provide your model number, serial number and bill of material number to obtain information on your unit. If necessary, contact the Product Service Department, Twin Disc, Incorporated, Racine, Wisconsin 53405-3698, USA by e-mail at service@twindisc.com.

Warranty

Equipment written about in this manual has a limited warranty. For details of the warranty, refer to the warranty statement at the front of this manual or contact any Twin Disc Authorized Distributor, service dealer, or the Warranty Administration Department, Twin Disc, Inc., Racine, Wisconsin, U.S.A.

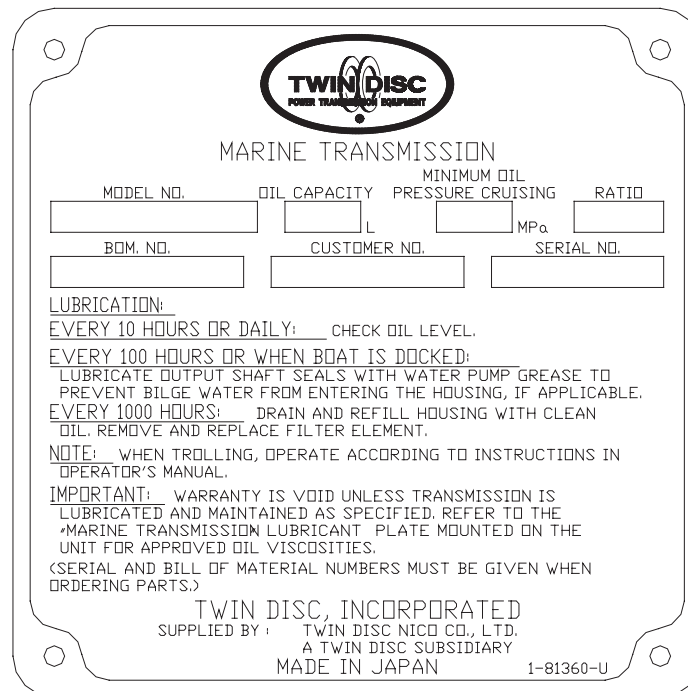
Description and Specifications

General

Drawings that identify installation information for the MG-5506 marine transmission are located at the end of this manual. This unit is only available as an engine mounted unit that attaches directly to the engine flywheel housing. The output shaft is parallel to the input shaft.

Nameplate

The nameplate identifies the model, bill of material (BOM) and the serial number of the unit. These numbers are necessary to identify the correct parts for your transmission.



The nameplate is a rectangular metal plate with rounded corners and four mounting holes. It features the Twin Disc logo at the top center, which consists of the words "TWIN DISC" in a bold, sans-serif font, with "POWER TRANSMISSION EQUIPMENT" in smaller text below it. Below the logo, the words "MARINE TRANSMISSION" are printed in a bold, sans-serif font. The nameplate contains several fields for identification information, each with a label and a corresponding box for the user to fill in. The fields are arranged in two rows. The first row includes "MODEL NO.", "OIL CAPACITY", "MINIMUM OIL PRESSURE CRUISING", and "RATIO". The second row includes "BOM. NO.", "CUSTOMER NO.", and "SERIAL NO.". Below these fields, there is a section for lubrication instructions, which includes a "LUBRICATION:" heading, followed by instructions for checking oil level, lubricating output shaft seals, and draining and refilling the housing. A "NOTE:" section follows, stating that the operator should follow the instructions in the operator's manual. An "IMPORTANT:" section states that the warranty is void unless the transmission is lubricated and maintained as specified. The nameplate also includes the company name "TWIN DISC, INCORPORATED", the supplier information "SUPPLIED BY: TWIN DISC NICO CO., LTD. A TWIN DISC SUBSIDIARY", and the location "MADE IN JAPAN". The part number "1-81360-U" is printed at the bottom right.

TWIN DISC
POWER TRANSMISSION EQUIPMENT

MARINE TRANSMISSION

MODEL NO. OIL CAPACITY MINIMUM OIL PRESSURE CRUISING RATIO
 BOM. NO. CUSTOMER NO. SERIAL NO.

LUBRICATION:
 EVERY 10 HOURS OR DAILY: CHECK OIL LEVEL.
 EVERY 100 HOURS OR WHEN BOAT IS DOCKED:
 LUBRICATE OUTPUT SHAFT SEALS WITH WATER PUMP GREASE TO PREVENT BILGE WATER FROM ENTERING THE HOUSING, IF APPLICABLE.
 EVERY 1000 HOURS: DRAIN AND REFILL HOUSING WITH CLEAN OIL. REMOVE AND REPLACE FILTER ELEMENT.

NOTE: WHEN TROLLING, OPERATE ACCORDING TO INSTRUCTIONS IN OPERATOR'S MANUAL.

IMPORTANT: WARRANTY IS VOID UNLESS TRANSMISSION IS LUBRICATED AND MAINTAINED AS SPECIFIED. REFER TO THE "MARINE TRANSMISSION LUBRICANT" PLATE MOUNTED ON THE UNIT FOR APPROVED OIL VISCOSITIES.
 (SERIAL AND BILL OF MATERIAL NUMBERS MUST BE GIVEN WHEN ORDERING PARTS.)

TWIN DISC, INCORPORATED
 SUPPLIED BY: TWIN DISC NICO CO., LTD.
 A TWIN DISC SUBSIDIARY
 MADE IN JAPAN 1-81360-U

Figure 1. Nameplate for MG-5506 Marine Transmission

Power Ratings

The MG-5506 transmissions can be operated through either the primary shaft or secondary shaft at its full rated horsepower when driven by a standard right hand rotation engine (counterclockwise flywheel rotation when viewing rear of engine).

Transmission clutches are hydraulically applied using main oil pressure. All bearings, clutches and gears are lubricated and cooled with low pressure oil.

Always reference the Bill of Materials (BOM) or Specification number when ordering service parts.

Construction Features

Housings

The MG-5506 series transmission has a two piece main housing. The front housing in size SAE No. 0 and 00 are available. The transmission is also available as a free standing unit. A top cover, a bottom cover, and a manifold complete the housing enclosure. The pump mounts on the secondary shaft, and the primary shaft has a cover.

Bearings

The primary and secondary clutch shafts are supported and located by a combination of straight and tapered roller bearings. Bearing clearances for each clutch shaft and pinion are set by use of a single shim pack at the rear tapered roller bearing on each shaft. A straight roller bearing, a tapered roller bearing, and a spherical roller bearing support the output shaft and bearing clearance is adjusted by using shims at the front bearing retainer.

Oil Pump and Drive

The oil pump is gear driven by the secondary clutch shaft.

Gears

All gears are helical, carburized, hardened and ground for smooth quiet operation. All gears are in constant mesh. The primary and secondary transfer gears/clutch spiders are shrunk-fit onto the primary and secondary shafts. Do not remove these gears during service. The output gear is mounted on a keyless taper.

Flexible Torsional Input Coupling

The purpose of the torsional coupling is to transmit power from the engine to the marine transmission through a rubber or silicone element that will:

- ☐ Dampen torsional vibrations.
- ☐ Change the natural frequencies of a system to move critical frequencies out of the operating speed range.
- ☐ Accommodate a certain amount of misalignment.
- ☐ Absorb shock and reduce noise.
- ☐ Minimize gear “rattle.”

The coupling has been selected based on the customer supplied engine information. Final coupling selection must be confirmed by the packager based on the torque/rpm ratings and the results of the system torsional vibration analysis (TVA), and on engine rotation. Care must be taken when servicing that replacement couplings are matched to this criteria.

Lubrication Features

The MG-5506 transmission bearings and clutches on the primary and secondary shafts are lubricated through oil passages drilled in the shafts. The output shaft bearings, transfer gears, primary and secondary pinions and their bearings are gravity and splash lubricated.

Suction Screen

The marine transmission has a serviceable suction strainer located below the oil pump. The strainer is between the sump and oil pump in the hydraulic circuit. The strainer can be replaced if necessary.

Filter Assembly

A spin-on style filter is located between the oil pump outlet and the selector valve in the hydraulic circuit. The replacement element should be replaced at 1000 hour or six month intervals, whichever comes first. The replacement filter part number is 1-83058-A. Units with the GP control valve require a different oil filter.

Heat Exchanger

The heat exchanger is designed to maintain the oil in the hydraulic system of the marine transmission at the proper temperature by passing raw water through the heat exchanger. The heat exchanger is located on the transmission housing. Replaceable zincs for corrosion protection are located on the heat exchanger rear and front end caps.

Specifications

Maximum operating speed: 2000 rpm

Operating oil sump temperature: 65–70°C (149–158°F) when using SAE 40 oil

Oil type and viscosity: See nameplate below

Oil capacity: 50 liters (13.2 gal)

Approximate dry weight: 2200 kg (4850 lb)

Oil pressure: [See Table 1](#). Oil temperature to be in normal operating range.

Table 1. Oil Pressure Specifications

Oil Pressure Specifications (Mpa)					
		Idle Speed		Rated Speed	
		Min	Max	Min	Max
Clutch Apply Pressure	Primary	0.05	--	2.0	2.3
	Neutral (Main)	0.05	--	1.0	
	Secondary	0.05	--	2.0	2.3
Lube Pressure	Primary	0.05	--	0.15	0.6
	Neutral (Main)	0.05	--	0.15	0.6
	Secondary	0.05	--	0.15	0.6

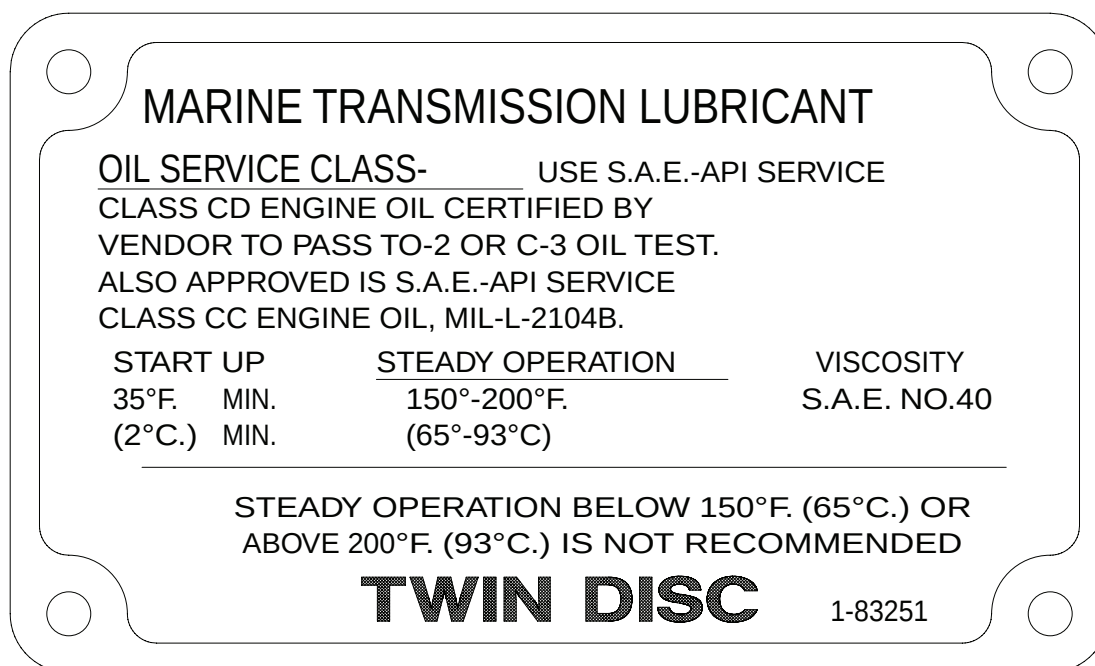


Figure 2. Nameplate with Oil Specification

Optional Equipment

The following optional equipment for use with the model MG-5506 is available through the nearest authorized Twin Disc distributor.

Optional Trailing Pump

A trailing pump kit is available that bolts onto the rear of the marine transmission.

Power Take-off

A live Pump Mount power take-off and a hydraulically clutchable power take-off are available and mount on the rear of the transmission. They rotate at the same speed and direction as the engine.

Mounting Brackets

Fabricated mounting brackets are available for rigid mounting.

Torsional Input Coupling

Several models of torsional input couplings are available.

Control Valves

The GP control valve, mechanical control valve, and electric solenoid controlled valve are available for the MG5506 marine transmission.

Coupling Flange

A coupling companion flange is available.

Trolling Valve

E-troll is available with the GP control valve.

Table 2. Bearing End Play Specifications

Primary and Secondary Shaft End Play		
Maximum Preload	Actual	Maximum End Play
0.0 mm (0.000 in.)		0.1 mm (0.004 in.)
Output Shaft end Play		
Minimum	Actual	Maximum
0.00 mm (0.000 in.)		0.05 mm (0.002 in.)

Table 3. Front Housing and Output Flange Runout Limits

Location	Maximum allowable total indicator reading
SAE # 00 front housing face	0.48 mm (0.019 in.)
SAE # 0 front housing face	0.41 mm (0.016 in.)
SAE # 00 front housing pilot diameter	*0.48 mm (0.019 in.)
SAE # 0 front housing pilot diameter	*0.41 mm (0.016 in.)
Output flange face near o.d.	0.10 mm (0.004 in.)
Output flange pilot diameter	0.10 mm (0.004 in.)
* This note applies to a continuous 270° arc if the balance of the pilot is negative in readings; otherwise it means all 360°.	

Torque Values for Fasteners

Note: Lubricate all threads and bearing face with light oil film prior to assembly.

Note: Use grade 5 and Property Class 8.8 specs when threading into aluminum.

Table 4. Metric Coarse Thread Capscrews, Bolts, and Nuts

Thread Size	Property Class 8.8		Property Class 10.9		Property Class 12.9	
	lb•ft	N•m	lb•ft	N•m	lb•ft	N•m
M6	6.5 - 7.5	9-10	9 - 10	12 - 14	10 - 12	14 - 16
M8	16 - 18	21 - 25	23 - 26	31 - 35	25 - 29	34 - 40
M10	32 - 36	43 - 49	44 - 51	60 - 68	51 - 59	70 - 80
M12	55 - 63	74 - 86	77 - 88	104 - 120	89 - 103	121 - 139
M16	132 - 151	179 - 205	189 - 217	256 - 294	219 - 253	298 - 342
M18	182-208	247-281	258-294	350-398	304-346	412-469
M20	257 - 295	348 - 400	364 - 418	493 - 567	429 - 493	581 - 669
M22	351-399	475-541	494-562	669-762	584-666	792-902
M24	445 - 511	603 - 693	626 - 720	848 - 976	737 - 848	1000 - 1150
M30	714 - 820	967 - 1113	1235 - 1421	1674 - 1926	1475 - 1697	2000 - 2301

Table 5. Metric Stainless Steel Capscrews, Bolts, and Nuts

Note: The use of nickel anti-seize compound is required to prevent corrosion due to galvanic action. Apply nickel anti-seize compound to the threads of these stainless steel fasteners before torquing to specification. See Standard Sheet S574B for a more complete listing of stainless steel fastener torque values.

Metric Coarse Thread Stainless Steel Capscrews, Bolts and Nuts	
Thread Size	Recommended Torque N•M (lb•ft)
M8	12 (8.5)
M10	24 (18)
M12	40 (30)
M14	63 (46)
M16	97 (72)

Table 6. Tapered Pipe Plugs (with thread lubricant)

Torque Values for Lubricated Pipe Plugs			
Recommended Torque in N•m (lb•ft)			
PT Size	NPTF Size	Installed in Cast Iron or Steel	Installed in Aluminum
1/16 - 28	1/16 - 27	11.5 ± 1.3 (8.5 ± 1.0)	7.5 ± 0.9 (5.5 ± 0.7)
1/8 - 28	1/8 - 27	14.2 ± 1.8 (10.5 ± 1.3)	8.8 ± 1.1 (6.5 ± 0.8)
1/4 - 19	1/4 - 18	34 ± 4 (25 ± 3)	22 ± 3 (16 ± 2)
3/8 - 19	3/8 - 18	37 ± 4 (27 ± 3)	23 ± 3 (17 ± 2)
1/2 - 14	1/2 - 14	68 ± 8 (50 ± 6)	41 ± 5 (30 ± 4)
3/4 - 14	3/4 - 14	73 ± 10 (54 ± 7)	46 ± 5 (34 ± 4)
1 - 11	1 - 11-1/2	109 ± 13 (80 ± 10)	68 ± 8 (50 ± 6)
1-1/4 - 11	1-1/4 - 11-1/2	115 ± 13 (85 ± 10)	75 ± 9 (55 ± 7)
1-1/2 - 11	1-1/2 - 11-1/2	115 ± 13 (85 ± 10)	75 ± 9 (55 ± 7)

Note: The lubricant is to be John Crane insoluble plastic lead seal No. 2 (or equivalent) or Loctite® No. 92 (or equivalent) and plugs are to be capable of removal without damage. Overtightening may cause initial leakage plus potential removal damage.

Note: An option of a maximum of two full turns after finger tightening the plug may be used if required and if removal conditions are met.

Table 7. Straight Threaded Tube Fittings, Hose Fittings, and O-Ring Plugs

Nominal Thread Diameter	Nm + or - 5%	lb•ft + or - 5%	Nominal Thread Diameter	Nm + or - 5%	lb•ft + or - 5%
5/16	5	3.5	1 5/8	108	80
3/8	11.5	8.5	1 7/8	108	80
7/16	16	12	2 1/2	108	80
1/2	20	15	M10x1.0	12	9
9/16	24	18	M12X1.5	16	12
5/8	24	18	M14X1.5	20	15
11/16	34	25	M16X1.5	24	18
7/8	54	40	M18X1.5	34	25
1 1/16	75	55	M22X1.5	54	40
1 3/16	88	65	M27X2.0	75	55
1 1/4	88	65	M33X2.0	88	65
1 5/16	108	80	M42X2.0	108	80
1 3/8	108	80	M48X2.0	108	80

Table 8. Tubing Nuts

Torque Values for Tubing Nuts	
Nominal Tube Size	Recommended Torque N•m (lb•ft)
8 mm	39 (29)
10 mm	52 (38)
12 mm	62 (46)
15 mm	103 (76)
21.7 mm	118 (87)

Clutch Plate Wear Limits

Clutch steel plates:

Minimum thickness: 2.25 mm (0.089 inches)

Clutch friction plates:

Minimum thickness: 3.70 mm (0.146 inches)

NOTES

Operation

General

The control valve obtains primary, neutral and secondary positions. When these positions are selected, the control valve directs high pressure oil through internal passages to operate the clutches. The pressure-rate of rise control piston within the mechanical control valve assembly, and the electric solenoid controlled control valve assembly, or the profile generator of the GP control valve Electronic Interface, provides a rapid, smooth oil pressure increase in the hydraulic system during clutch engagement.

Note: Later transmissions may have model EC050 controls replacing the profile and e-troll modules that are discussed in this manual. See EC050 Control manual #1022756 for operational and diagnostic functions, and installation issues.

Hydraulic System with Mechanical Control Valve

The oil pump draws oil through the strainer from the oil sump and discharges it through the oil filter. Filtered oil enters the control valve through the inlet port. The incoming oil forces the pressure regulator piston against the springs to open the path to the lubrication circuit. Oil not used for clutch engagement flows past the regulator piston to become lubrication oil. Lubrication oil flows through the heat exchanger to the lubrication oil circuit in the transmission to lubricate and cool the clutches and bearings. There is a lubrication oil pressure relief valve to limit maximum lubrication oil pressure to approximately 690 kPa (100 psi).

In Neutral, the inlet port of both clutches is connected to the atmosphere. Since the area behind the clutch pistons is open to sump, the clutches are disengaged. Oil is distributed through the lubrication system. The area between the pressure regulating piston and the rate-of-rise piston is connected to sump at all times to prevent any leaking oil from affecting the pressure regulation.

The pressure in the rate-of-rise chamber is controlled by an orifice (during clutch engagement) and a check ball (during clutch disengagement) that is spring loaded against the cover passage. The passage behind the ball and spring is connected to sump (atmosphere) in Neutral and to main pressure when either clutch is engaged.

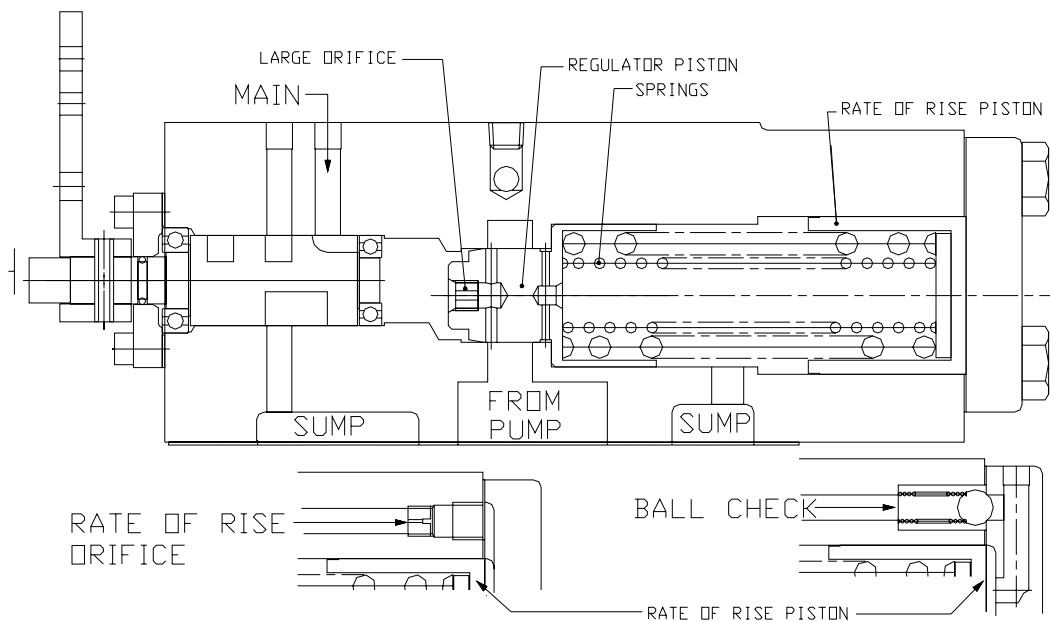


Figure 3. Mechanical Valve

When the control valve is shifted to engage either clutch, the valve directs main pressure to engage the selected clutch pack. Oil is also directed thru the rate of rise orifice to move the rate-of-rise piston, compressing the pressure regulator springs. This progressively increases the clutch engaging pressure causing the clutches to engage at a controlled rate.

The control valve allows only one clutch to be engaged at a time, and the oil from the disengaged clutch is vented to sump (atmospheric pressure). The clutch return springs move the disengaged clutch's piston to the disengaged position minimizing clutch plate drag.

Manual Control Valve — Neutral

[Refer to Figure 3.](#) Oil enters the control valve body from the pump and fills the valve cavity. The oil flows through the passages at the left end of the regulator piston, pressurizing the cavity to the left of the regulator piston. This causes the pressure regulating piston to partially compress the piston outer and inner springs against the pressure-rate control piston. This pressurizes the oil in all main cavities. This pressure varies with engine speed.

The movement of the pressure regulation piston against the springs exposes the lube passage in the valve body. This passage directs overage oil to the lubrication oil circuit. The passages that engage the primary and secondary clutches are interconnected by a slot in the control valve stem when in the neutral position. The slot is aligned with a drilled hole and cored cavity in the face of the valve body. The drilled hole and cored cavity are aligned and drilled holes that pass through the main housing to sump. Therefore these passages are at atmospheric pressure at this time. Also, the passages that are used to supply main pressure to the rate of rise chamber during engagement are at atmospheric pressure because the valve slots interconnects with the sump passage. The area between pistons and around the springs is vented to the sump of the transmission. This area is at atmospheric pressure at all times permitting the return to sump of any leakage oil past the pistons.

Manual Control Valve — Primary and Secondary

When a shift to the primary or secondary position is desired, the control valve lever is moved. The shift causes the control valve stem to rotate, allowing main oil to enter the clutch port, and also to pressurize the passage to the rate of rise orifice, and the ball check passage. The orifice meters the oil into the rate of rise chamber for a steady, smooth pressure rise. As the rate of rise chamber fills with oil, the pressure rate of rise piston moves against the springs until the piston is stopped by a shoulder in the valve body. This causes the main pressure to rise to clutch engaging pressure. When in primary, the secondary passage remains at atmospheric pressure because the slot remains open to sump, and vice versa. Main pressure is also keeping the ball check valve closed.

When a shift is made from primary to neutral, the valve stem is rotated, exposing both of the clutch passages to sump. Under these conditions, the passage that supplied pressure to the clutch is connected to sump, and the oil drains rapidly from the primary clutch to sump. Because the passage that supplied main pressure to the ball check valve is now at atmospheric pressure, the oil pressure in the chamber unseats the steel ball against the compression spring permitting a rapid oil drain from the rate of rise chamber to sump and allowing the pressure-rate of rise piston to move back against the end plate. The primary clutch is now disengaged and main system pressure reduced to neutral pressure. The same principles apply to the secondary clutch engagement and disengagement.

Hydraulic System with Optional Electric Control Valve (1018084)

The oil pump draws oil through the strainer from the oil sump and discharges it through the oil filter. Filtered oil enters the control valve through the inlet port. The incoming oil forces the pressure regulator piston against the springs to open the path to the lubrication circuit. Oil not used for clutch engagement flows past the regulator piston to become lubrication oil. Lubrication oil flows through the heat exchanger to the lubrication oil circuit in the transmission to lubricate and cool the clutches and bearings. There is a lubrication oil pressure relief valve to limit maximum lubrication oil pressure to approximately 690 kPa (100 psi).

In Neutral, the inlet port of both clutches is connected to the atmosphere. Since the area behind the clutch pistons is open to sump, the clutches are disengaged. Oil is distributed through the lubrication system. The area between the pressure regulating piston and the rate-of-rise piston is connected to sump at all times to prevent any leakage oil from affecting the pressure regulation.

The pressure in the rate-of-rise chamber is controlled by a ball that is spring loaded against the orifice plate. The passage behind the ball and spring is connected to the sump (atmosphere) in Neutral and to main pressure when either clutch is engaged. A shuttle ball, connected to both clutch pressure ports, permits pressurizing this passage with oil from the engaged clutch without allowing oil to flow to the disengaged clutch.

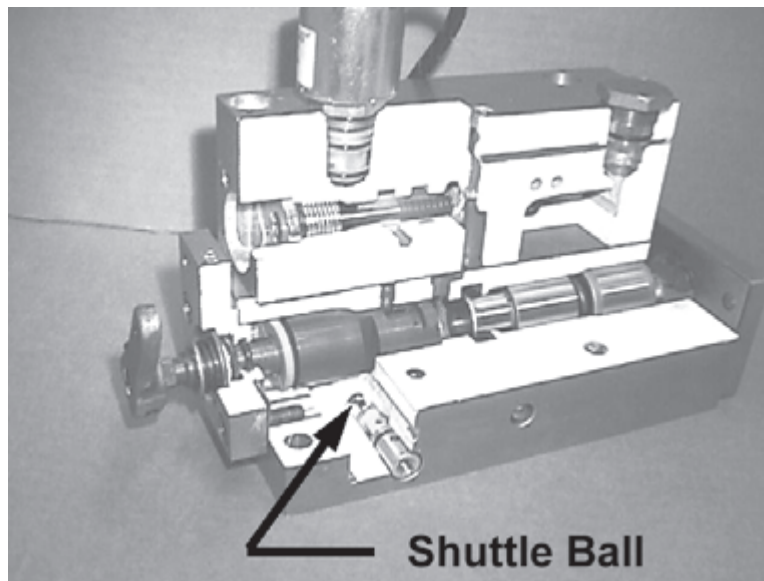


Figure 4. Location of Shuttle Ball

The electric control valve can be used in a manual override mode in the event of an electrical power failure.

When the control valve is energized or shifted to engage either clutch, the valve directs main pressure to engage the selected clutch pack. Oil is also directed to move the rate-of-rise piston, compressing the pressure regulator springs. This progressively increases the clutch engaging pressure causing the clutches to engage at a controlled rate.

The control valve allows only one clutch to be engaged at a time, and the oil from the disengaged clutch is vented to sump (atmospheric pressure). The clutch return springs move the disengaged clutch's piston to the disengaged position minimizing clutch plate drag.

Control Valve Assembly in Neutral

Some of the main pressure oil from the oil inlet chamber flows through a passage to the orifice in the orifice plate. The small flow of oil through this orifice fills and begins to pressurize the rate-of-rise chamber.

Both clutches are connected to sump when the control valve is in Neutral. Since there is no pressure acting on the shuttle ball from either clutch, the passage behind the ball and spring regulator is also connected to sump. This allows the oil pressure in the rate-of-rise chamber to be regulated by the ball and spring, since the overage oil can flow to sump. The oil pressure in the rate-of-rise chamber acting on the rate-of-rise piston causes it to stroke over partially, which compresses the pressure regulating springs additionally.

This additional spring compression further resists the movement of the pressure regulating piston, resulting in a force balance between the area at the pressure regulator, the springs, and the area behind the rate-of-rise piston. Neutral main pressure of approximately 40 psi is maintained by relieving excess oil behind the rate of rise piston through the ball and spring regulator.

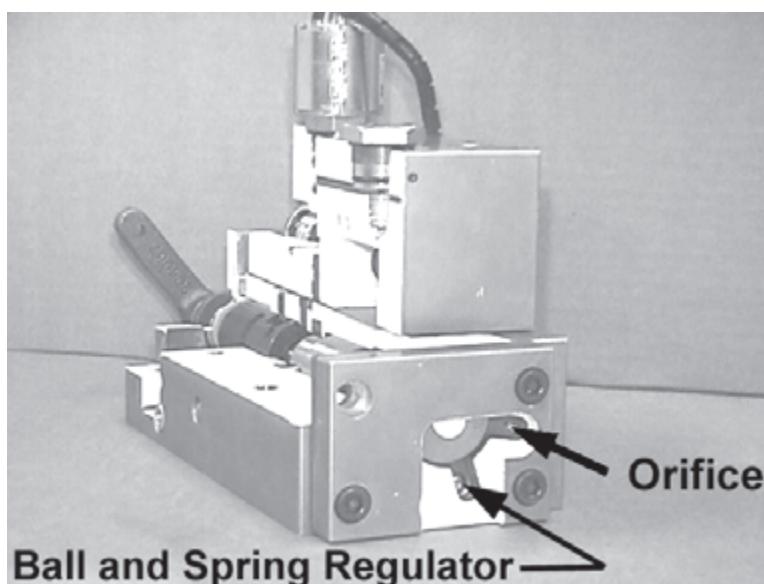


Figure 5. Neutral Regulator and Rate of Rise Orifice

Control Valve Assembly in Primary or Secondary

Pressurized oil is directed to one of the transmission's clutches to engage it. The pressurized oil in the clutch port of the engaged clutch acts on the shuttle ball, sealing off the passage to the opposite clutch. The pressurized oil also forces the ball of the ball and spring regulator against its seat on the orifice plate, stopping the flow of oil from the rate-of-rise chamber to sump. Since oil continues to flow into the rate-of-rise chamber through the orifice, the oil pressure in the rate-of-rise chamber increases. This increased oil pressure forces the rate-of-rise piston to stroke over to its stop in the valve body, compressing the pressure regulating springs even further yet.

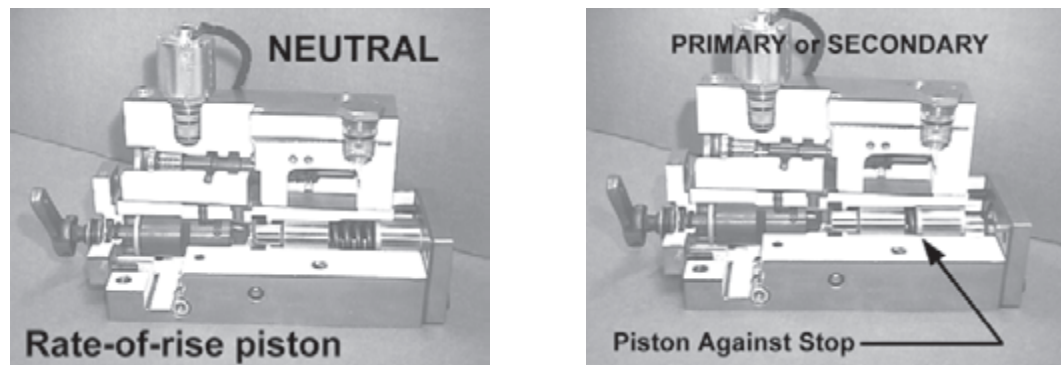


Figure 6. Rate of Rise Piston in Neutral (left) and Rate of Rise Piston with Clutch Engaged (right)

The travel rate of the rate-of-rise piston (and resulting pressure rate-of-rise) is controlled by the orifice size, regulator spring stiffness and the final main pressure after completion of the rate-of-rise cycle. Neutral main pressure controls the start time of the rate-of-rise cycle. When the rate-of-rise piston is against the stop (pressure regulating springs are compressed the most), the main oil pressure reaches approximately 250 psi.

When the control valve is shifted to Neutral, the clutch that was engaged is vented to sump within the valve. As a result, the passage behind the ball and spring regulator is vented to sump and induces a high differential pressure between the rate-of-rise chamber and the passage behind the ball and spring. Since the pressure in the rate-of-rise chamber is much greater than the pressure it is to be regulated at, the ball unseats from the orifice plate, allowing main oil pressure to return to the neutral pressure level rapidly and again be regulated by the ball and spring regulator. The ball returns to the pressure regulating position once the spring force is equal to force induced by the pressure at the rate-of-rise piston.

Electric Operation

The transmission normally operates with the control valve in the electric mode. Two spools, each controlled by a solenoid operated pilot valve, control clutch engagement. When a solenoid is energized, it opens the pilot valve and allows main pressure oil to flow to the end of the spool. The pressure acting on the end of the spool overcomes the return spring at the opposite end, causing the spool to stroke over and connect the clutch passage with main pressure passage.

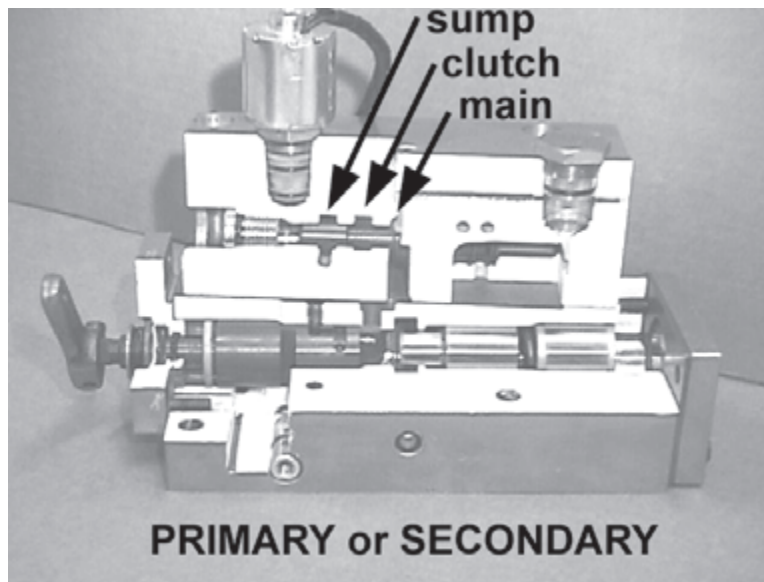


Figure 7. Pilot Spool Passages

Main pressure oil flows from the spools above to the clutch passages of the transmission below via connecting slots in the manual override stem. These connecting slots are aligned with passages in the valve body when the valve is in the electric mode.

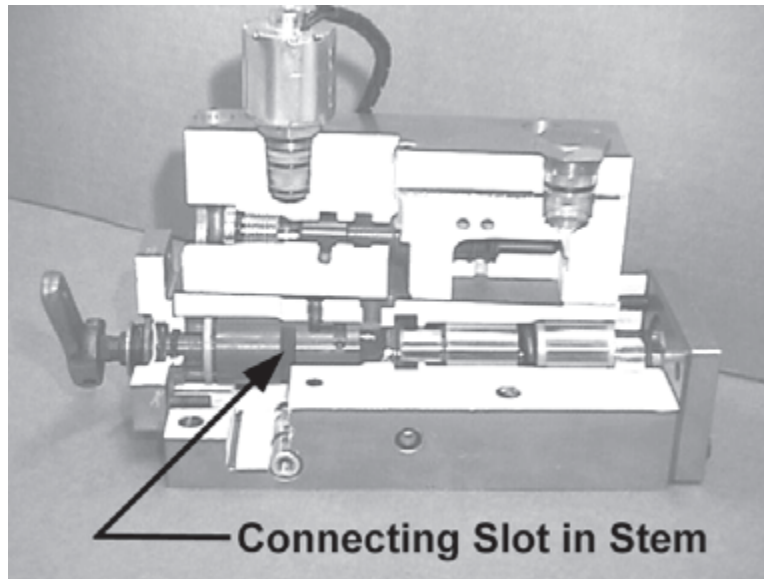


Figure 8. Flow Path in Override Spool

Main pressure from the energized solenoid operated pilot valve also acts on a pin on the return spring side of the opposite spool to ensure the opposite spool is connecting its clutch to sump. The clutch engagement cycle is outlined in the previous section.

Hydraulic Lock Feature (some models)

Some control valve models have a hydraulic lock feature, and are identifiable by a third solenoid operated pilot valve. This feature keeps the engaged clutch pressurized as long as the engine remains running, should electrical power fail or malfunction occur while the clutch is engaged. The hydraulic lock is accomplished by allowing pressurized oil (from the pressurized clutch passage) to flow inside the spool. Oil pressure inside the spool forces the dowel pin against the O-ring plug.

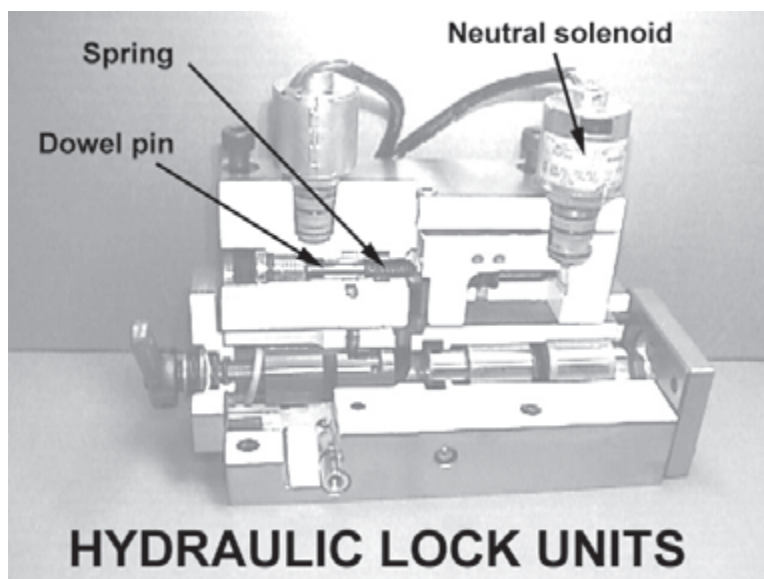


Figure 9. Hydraulic Lock Units

The resulting reaction is a force on the spool that overcomes the spool's return spring force. Should the solenoid become de-energized while the spool has its clutch pressurized, oil pressure will keep the spool in that position. This keeps the transmission in gear as long as the engine is running.

The hydraulic lock is disabled when either the engine is stopped, or the neutral solenoid is energized. When the neutral solenoid is energized, it sends pressurized oil to the dowel pins at the return spring end of each spool. Since the dowel pin used at the return spring side of the spool is larger in diameter than the dowel pin inside the spool, the hydraulic force acting on the larger pin forces the spool to connect the clutch passage to sump with assistance from the return spring.

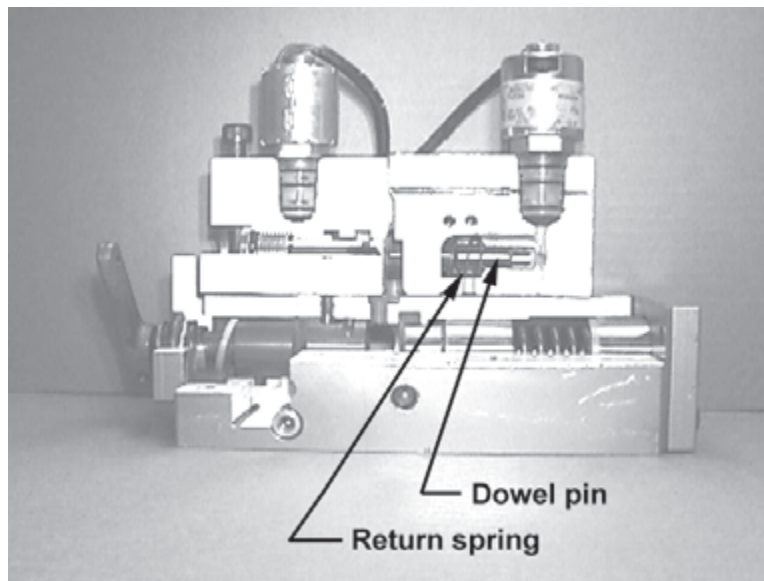


Figure 10. Neutral Solenoid Engaged

Manual Override Operation

The control valve has a manual override feature, which is a lever operated selector. When the manual override lever is rotated counterclockwise and pulled outwards, the upper portion of the valve is disabled because the connecting slots in the manual override stem are no longer aligned with the oil passages in the valve body. Oil pressure from the solenoid operated pilot valve controlled spools cannot reach the clutch pressure passages in the transmission. The main oil pressure regulator, shuttle ball, neutral pressure regulator, and rate-of-rise functions remain exactly the same as when the valve is in the electric mode. In the manual override position, shifting is controlled by rotating the lever on the manual override stem.

In the Neutral position, both clutches are vented to sump by two pockets in the stem.

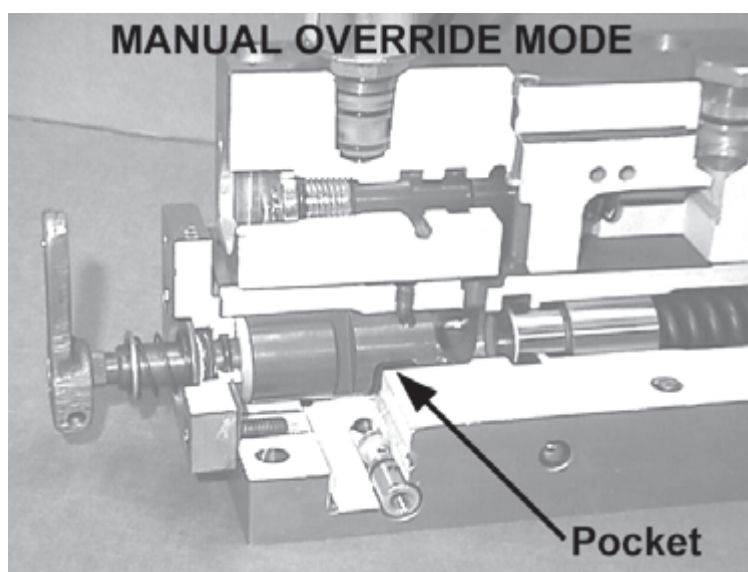


Figure 11. Stem Pocket or Passage

Main pressure oil can flow through the hole in the end of the stem to a narrow slot between the two pockets. This slot does not connect to any other passages when the stem is in the Neutral position.

When the lever and stem are rotated to engage either the primary or secondary clutch, main pressure oil flows through the slot in the stem to the appropriate clutch pressure port. The opposite clutch port passage remains connected to sump by the same pocket in the stem as when the stem was in the Neutral position. When the stem is rotated back to the Neutral position, the main pressure oil slot in the stem is no longer aligned with either clutch port. Both clutches are again vented to sump by the two pockets in the stem.

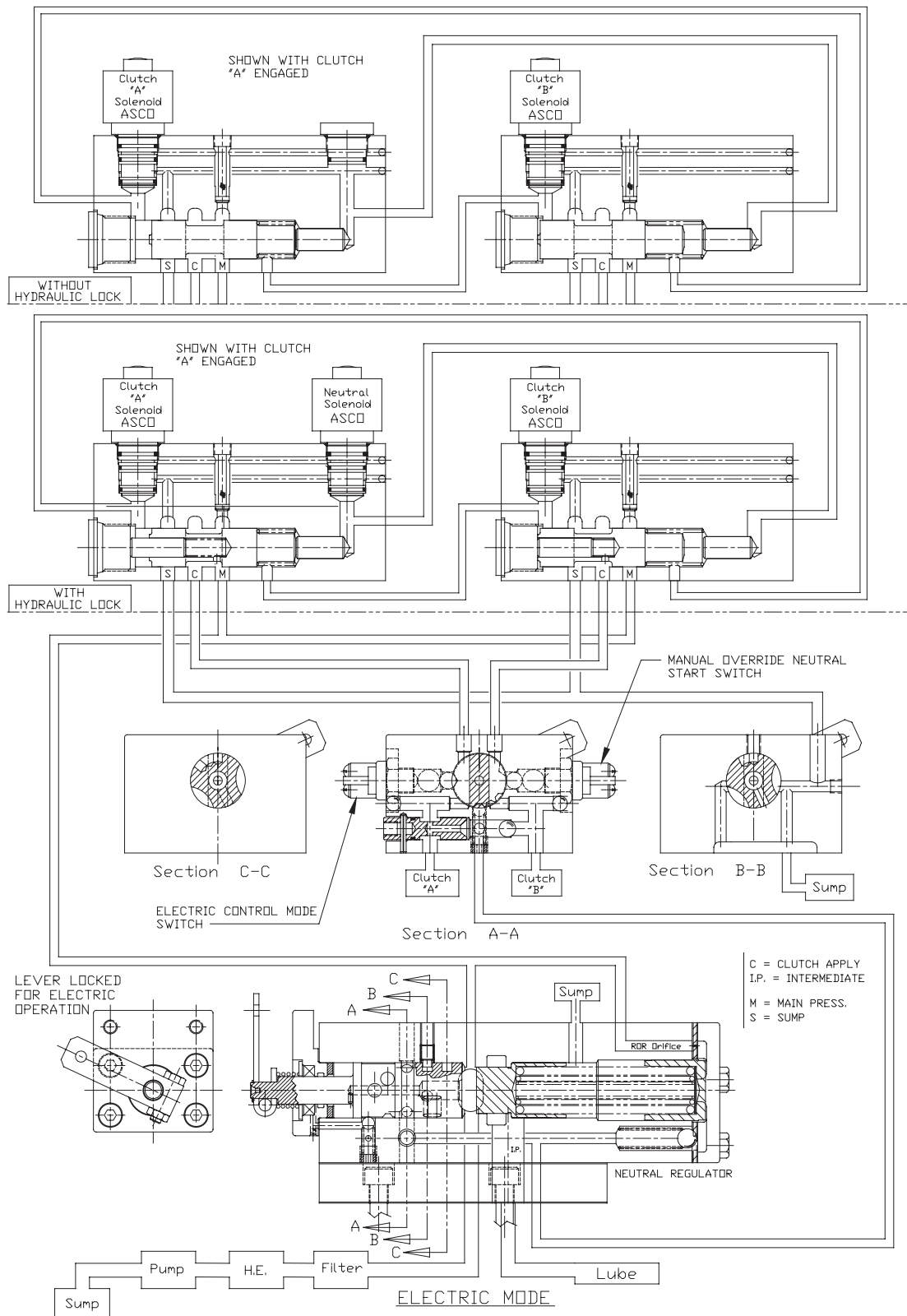


Figure 12. Hydraulic Schematic (electric control valve)

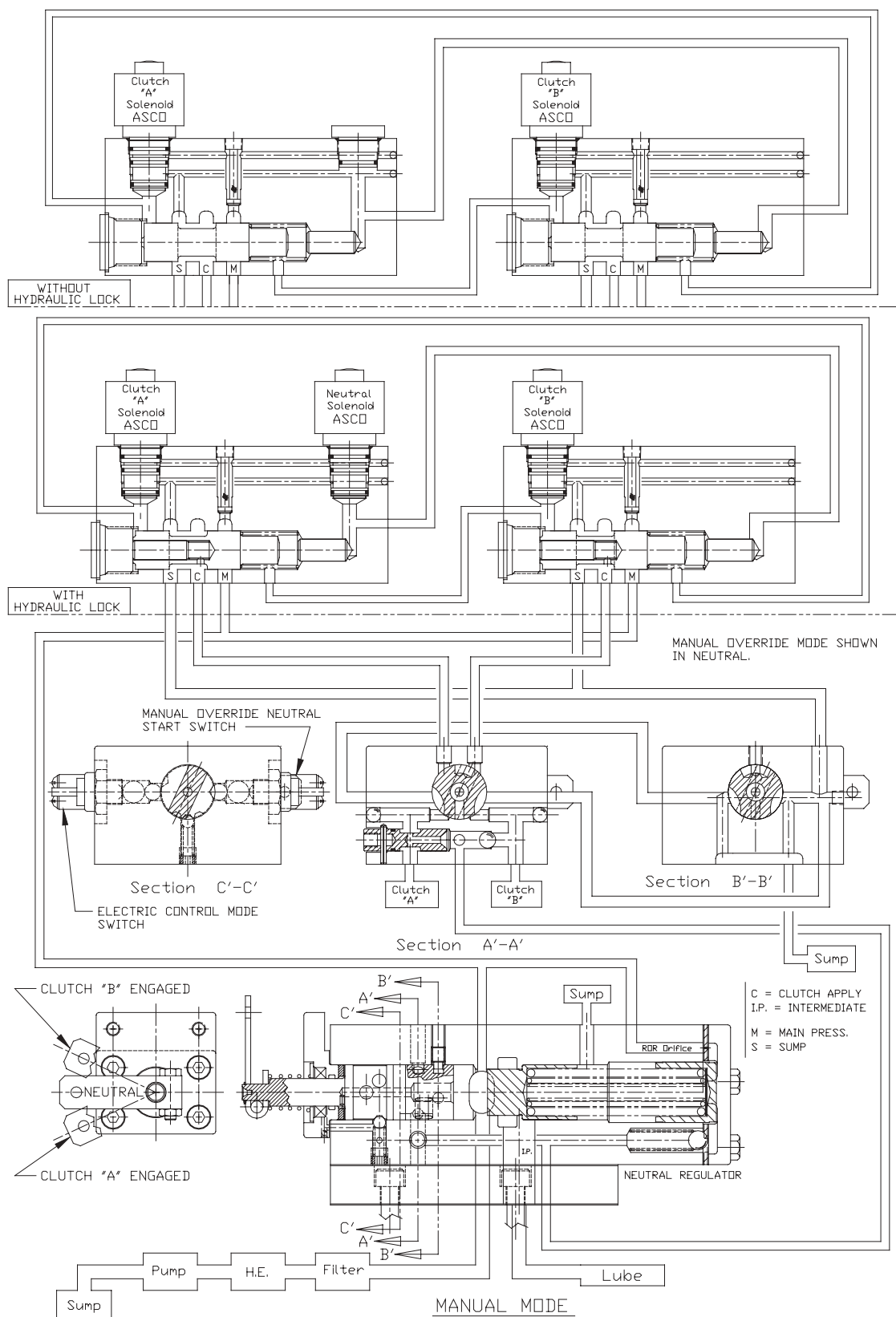


Figure 13. Hydraulic Schematic (electric control valve in manual mode)

General Overview of GP Control Valve with Electronic Interface

The General Purpose (GP) control valve is a hydraulic valve assembly for use with Twin Disc Marine Transmissions, that may include an integral electronic interface control module. The valve assembly contains current controlled proportional cartridges.

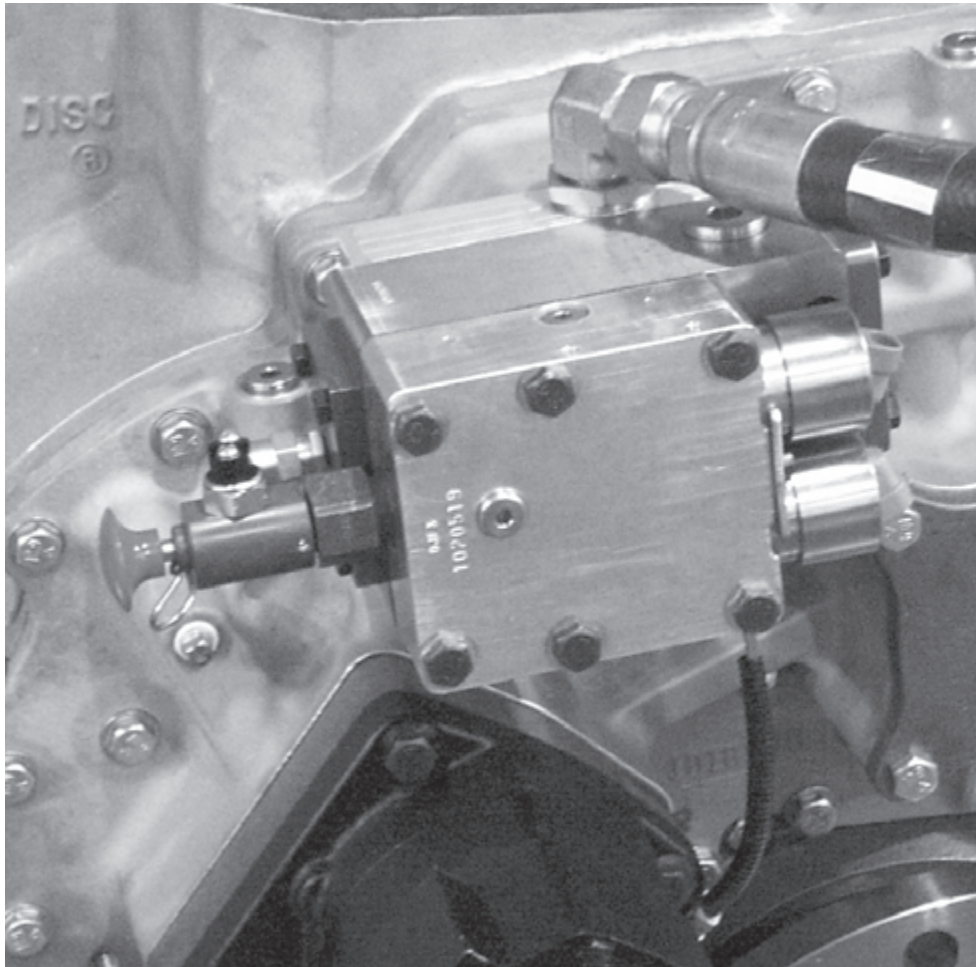


Figure 14. GP Valve Assembly mounted on Marine Transmission (typical).

GP Control Valve Hydraulic Portion

The hydraulic portion of the GP Control Valve is made up of two blocks, a lower main regulator valve body, and an upper valve body. These valve bodies contain two electrically actuated proportional cartridges, a hydraulic pressure regulator and a manual direction control cartridge valve. The regulating valve body contains a ball check valve assembly in parallel with an orifice with a filter that provides rapid fill and damping for the rear cavity of the regulator valve. The manual direction control cartridge valve contains a switch that is closed when the valve is in the neutral position. Separate identical proportional cartridges are used for the primary and secondary clutch actuation. When the primary or secondary clutch is selected by the operator, the control valve directs high-pressure oil through internal passages to operate the clutches. The pressure-rate of rise (profile) is controlled electronically by the GP Control Valve Electronic Interface (Profile or E-Troll Module) to provide a rapid, smooth, oil pressure increase in the clutch hydraulic passages during engagement.

CAUTION

The proportional valve coils are low resistance devices that are current driven. The use of an uncontrolled power source may supply too much current and damage the proportional valve.

Note: Installations with this valve must include an oil filter with the proper filtering characteristics. This valve requires a filtration level of 16 micron at an efficiency of 98% (beta ratio = 75) or better. Besides the valve's requirement on filtration, the filter must meet the requirements of the transmission (operating pressure, flow, etc.)

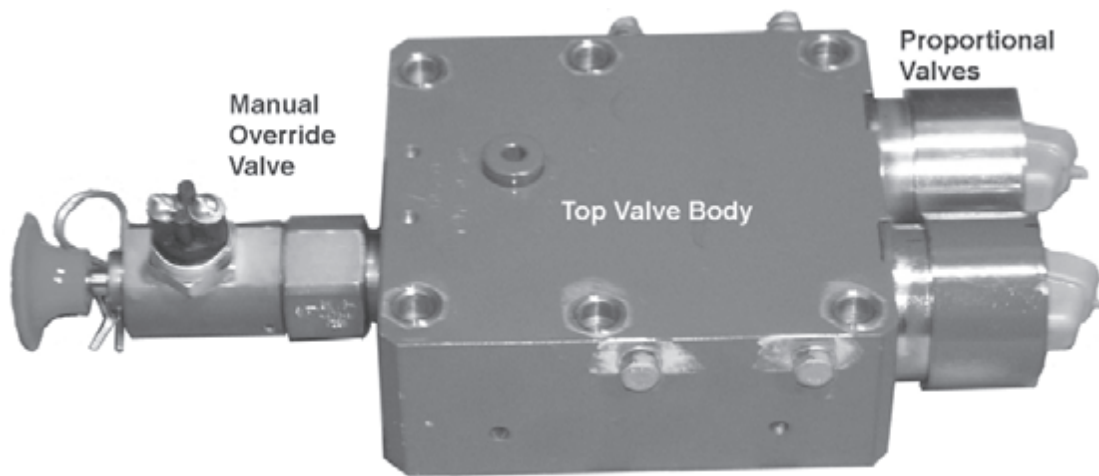


Figure 15. Top Hydraulic Valve Body Assembly

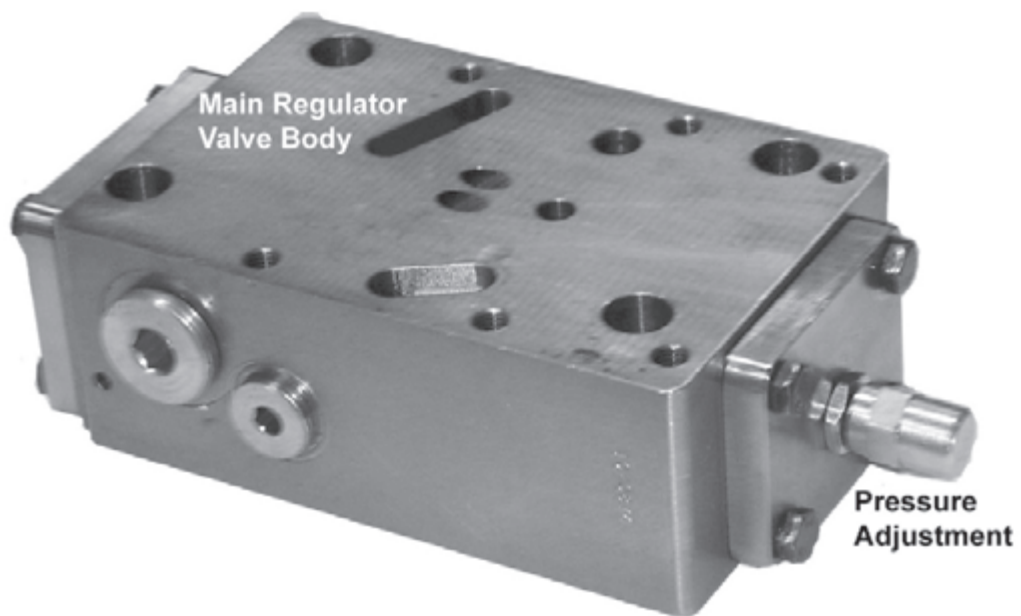


Figure 16. Main Regulator Hydraulic Valve Assembly

GP Control Valve Electronic Control Interface (Profile or E-Troll Module)

Note: Some installations will consist of the hydraulic portion of this valve, and the Electronic Control Interface will be replaced by an appropriate electronic control system.

The electronic portion of the GP Control Valve fastens to the hydraulic portion of the GP Control Valve, and is located on the top surface.

WARNING

If the ambient temperature of this mounting location exceeds 180°F, the Electronic Control Interface must be relocated to a cooler area. Contact Twin Disc for proper harnessing instructions.

This module contains the electronic circuitry to control the proportional cartridges that are used to engage the clutches based on the commands from the operator. Clutch apply pressure rate of rise (profile) is factory set with the use of internal circuitry. The initial fill level is factory set with an adjustment screw that is embedded in the bottom surface of the Profile or E-Troll Module, and sealed. This can be field adjusted if necessary by authorized personnel with the proper instrumentation. There are different control module types for marine transmissions (MG), both with and without the trolling (E-Troll) feature. All electrical wiring for the marine transmission system controls are routed through this interface module. The vessel battery power (12 vdc or 24 vdc) is supplied to the electronic interface only, and never directly to the hydraulic proportional valves. Two red led lights are used to identify the proportional cartridge valve that is energized, and a green led is used to identify when power is provided to energize one of the clutches. Flashing lights are used in troubleshooting. Signals are provided to power a customer supplied relay to allow engine starting only when in neutral. A Transmission oil temperature sensor is required for some marine transmission (MG) models. Engine speed and Propeller speed sensors are required for transmissions with E-Troll. The following figures show the various versions of Electronic Profile or E-Troll Module.

WARNING

Do not connect valve coils directly to battery power supply voltage. Use an approved Twin Disc Control System.



Figure 17. Electronic Profile Module (MG non-troll)

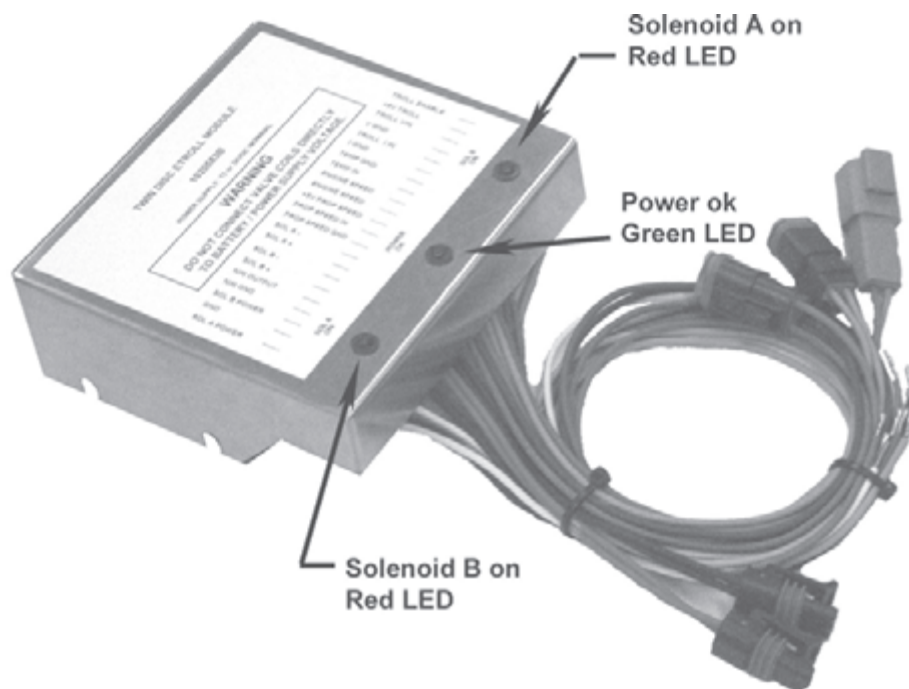


Figure 18. Electronic E-Troll Module (MG E-Troll)

Hydraulic System with GP Control Valve

The oil pump draws oil through the strainer from the oil sump and discharges it through the heat exchanger to the oil filter. Filtered oil enters the control valve through the inlet port. The incoming oil is supplied to the main pressure regulating relief pilot cartridge and the main regulating valve cartridge, satisfying the main pressure requirements of the transmission, cascading all remaining oil flow into the lubrication circuit. Oil not used for clutch engagement flows past the regulator piston to become lubrication oil. Lubrication oil flows through the lubrication oil circuit in the transmission to lubricate and cool the clutches and bearings.

Main pressure is supplied to the inlet of each proportional valve, and to the inlet of the manual direction control valve. In Neutral, the inlet port of both clutches is connected to the sump. Since the area behind the clutch pistons is open to sump, the clutches are disengaged.

When one of the clutches is commanded to engage, the proportional valve directs main pressure to engage the selected clutch pack. The rate-of-rise is controlled electronically and prefills the engaging clutch at a predetermined level, and then increases to full pressure, following a predetermined timing sequence. The initial prefill level is factory adjustable by means of an adjustment screw embedded in the bottom surface of the electronic interface. Field adjustment of this feature should never be attempted without special equipment and knowledge of its use to prevent serious mechanical damage to the marine transmission or vessel.

The electronic interface portion of the control valve allows only one proportional valve to be energized at a time, thus, only one clutch can be engaged at a time, and the oil from the disengaged clutch is vented to sump (atmospheric pressure). The clutch return springs move the disengaged clutch's piston to the disengaged position minimizing clutch plate drag.

Note: Installations with this valve must include an oil filter with the proper filtering characteristics. This valve requires a filtration level of 16 micron at an efficiency of 98% (beta ratio = 75) or better. Besides the valve's requirement on filtration, the filter must meet the requirements of the transmission (operating pressure, flow, etc.)

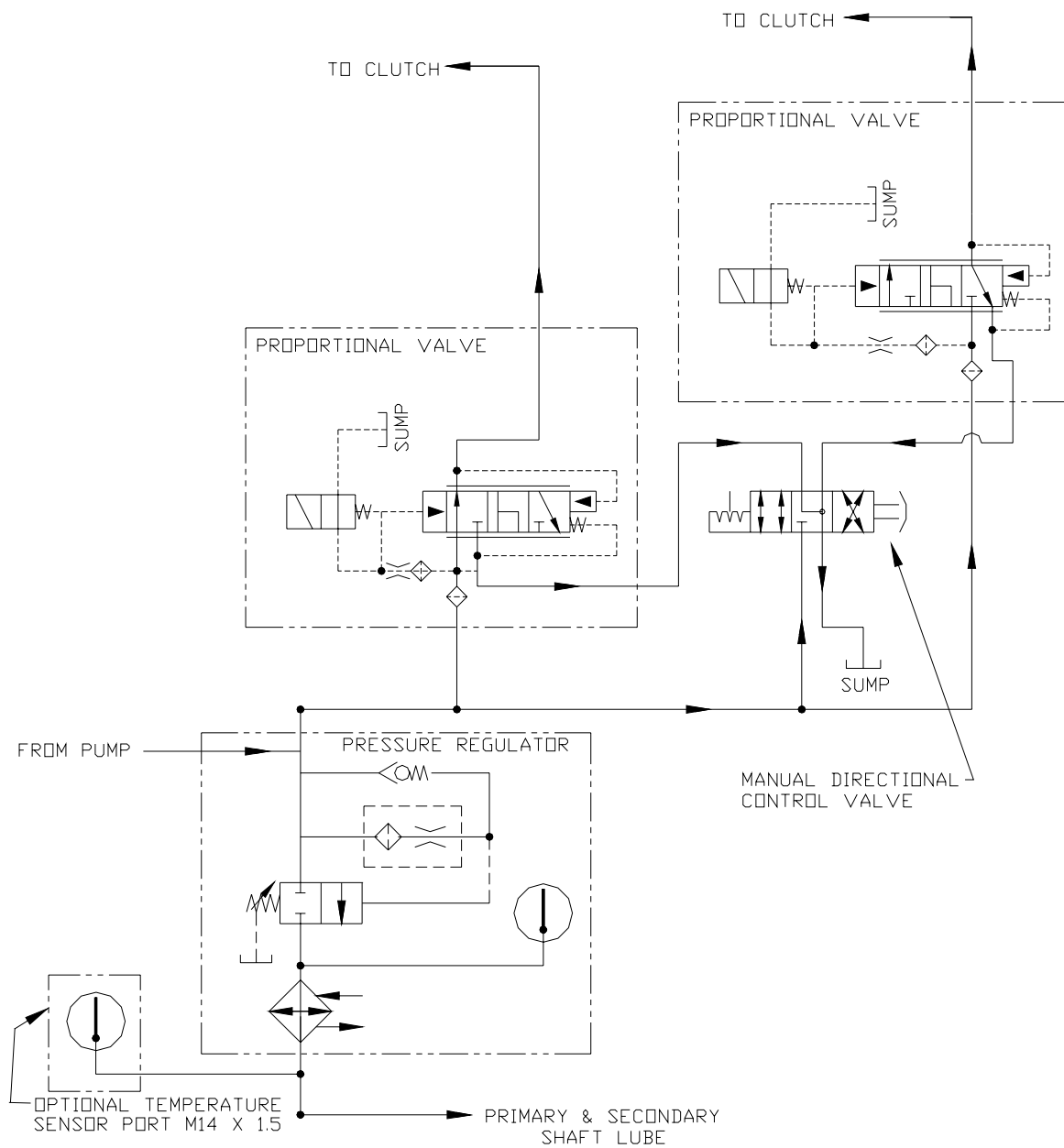


Figure 19. Hydraulic Schematic (GP control valve)

Manual Direction Control Valve Operation

The manual direction control valve is locked in the NEUTRAL (center) position during normal operation. There are three possible positions of the manual direction control valve stem. If conditions exist that the operator wishes to manually operate the transmission for any reason, the operator can remove the locking pin from the direction control valve, and push the stem into the valve for the engagement of clutch A, or pull it out of the valve for the engagement of clutch B. The manual direction control valve has an integral switch with contacts that are closed only when the manual direction control valve is in the NEUTRAL position. This switch must be wired such that the engine cannot be started while clutch A or clutch B is engaged.

CAUTION

Engagement of a clutch with the Manual Direction Control Valve should only be done with the engine at idle speed.

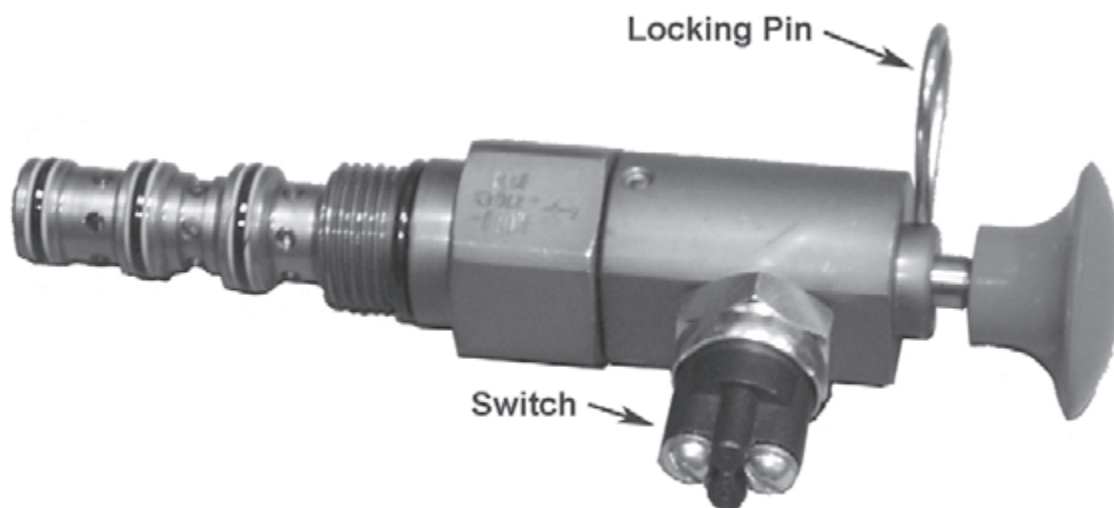


Figure 20. Manual Direction Control Valve

Power Take-off (Optional)

There are two types of Power Take Offs available for this marine transmission. Both are designed to drive hydraulic pumps meeting SAE-J-744 with flange size 127, and shaft size 32-4 (SAE "C" 4 bolts).

Live Pump Mount Power Take-off

The live pump mount power take-off drives accessories using engine horsepower. Since the live power take-off connects the accessory to the primary shaft of the transmission via a direct coupling, the accessory is driven when the engine is running.

Hydraulic Clutched Pump Mount Power Take-off

The hydraulic clutched power take-off also allows accessories to be driven using engine horsepower. Since the power take-off is attached to the primary shaft of the transmission, the accessories can be driven any time the engine is running. The power take-off is engaged by the power take-off electric control valve that can be engaged manually if necessary.

The hydraulic clutched power take-off operates with oil pressure supplied by the transmission's hydraulic system.

Trailing Pump (Optional)

The trailing pump is used to supply oil flow to the transmission lubrication circuit when the transmission is in a backdriving condition. Backdriving occurs when the engine is shut down and the transmission output shaft is being driven by water flow across the propeller.

The trailing pump is driven by the output shaft, and oil flow from the trailing pump flows through a check valve into the transmission's lubrication circuit below the heat exchanger.

Power Flow

Input power to the transmission is through a torsional coupling mounted on the engine flywheel. The coupling is splined to the forward end of the primary (forward clutch) shaft causing the primary shaft to rotate in engine direction during engine operation. Power is transmitted to the secondary shaft by means of the transfer gear teeth on the outer diameter of the primary clutch housing. These teeth are in constant mesh with gear teeth on the secondary clutch housing causing the secondary shaft to rotate in anti-engine direction. The primary and secondary pinions on their respective shafts, are in constant mesh with the output gear, which is connected to the output shaft through a keyless tapered joint.

Application of the primary clutch locks the primary pinion to the primary shaft causing the pinion to turn in the shaft direction and causing the output shaft to rotate in anti-engine direction. Application of the secondary clutch locks the secondary pinion to the secondary shaft causing the pinion to turn in the shaft direction and causing the output shaft to rotate in engine direction.

Neutral

When in Neutral the primary and secondary shafts, transfer gears and clutch friction plates rotate at engine speed.

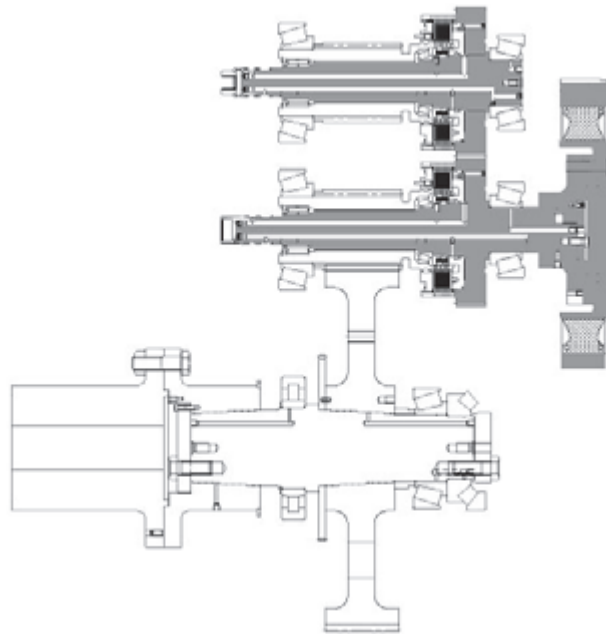


Figure 21. MG-5506 Power Flow in Neutral

Primary

When the Primary position is selected, hydraulic pressure is applied to the primary clutch piston clamping the friction and steel clutch plates together. The primary input pinion will then rotate at engine speed and direction because the steel plates are spline-connected through the clutch hub assembly to the pinion. Because the primary input pinion is in mesh with the output gear, the output gear and shaft will rotate in anti-engine direction. The secondary input pinion will be backdriven (engine direction) when the unit is in the primary position.

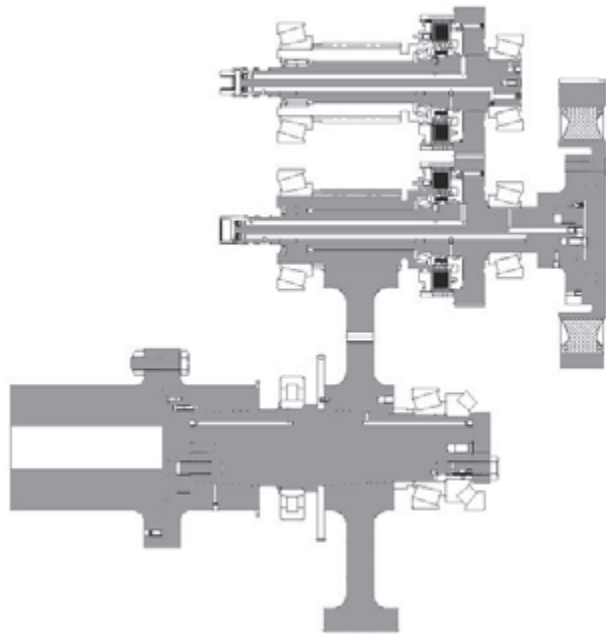


Figure 22. MG-5506 Power Flow with Primary Clutch Engaged

Secondary

In Secondary, the same parts are turning that were turning in Neutral. When the secondary position is selected, hydraulic pressure is applied to the secondary clutch piston clamping the friction and steel plates together. The secondary input pinion will then rotate at engine speed and anti-engine direction, because the steel clutch plates are spline connected through the clutch hub assembly to the input pinion. Because the secondary input pinion is in mesh with the output gear, the output gear and shaft will rotate in engine direction. The primary input pinion will be backdriven (anti-engine direction) when the unit is in the secondary position.

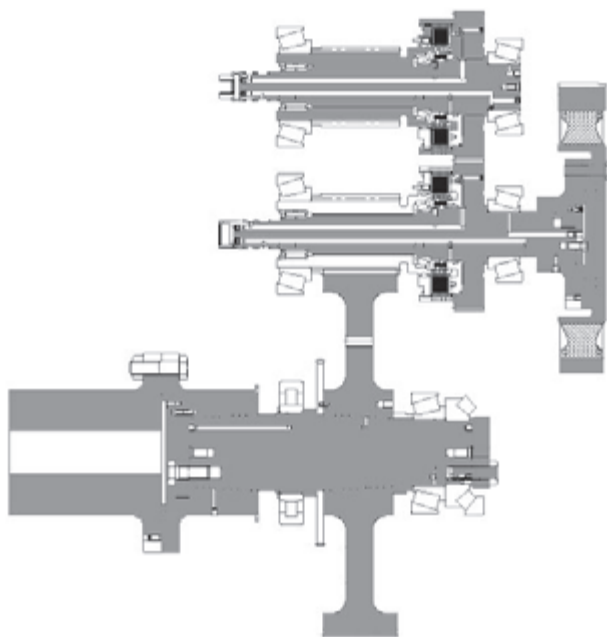


Figure 23. MG-5506 Power Flow with Secondary Clutch Engaged

Preventative Maintenance

Lubrication

No other lubrication is required beyond the daily oil check.

Oil System

Oil Level

The oil level should be checked daily or every 10 hours. Check oil level before starting the engine to confirm that the transmission has oil in it. With the engine running at low idle and the transmission in Neutral, check the oil again. The oil level should be near the “low” oil level mark. Transmission oil temperature should be in the normal operating range prior to finalizing the oil level between the low and full marks on the oil level gauge.

Oil and Filter Change Interval

With a new transmission, change the oil and filter element within the first 50 hours of operation. Change oil and filter element after each 1000 hours thereafter or more often depending on conditions.

For a rebuilt transmission, check the filter element after eight hours of operation. If the filter is clean, install a new filter element and then change the oil and filter element after 1000 hours of service. If the filter is dirty, change the element and operate for another eight hours. Check the filter again. Continue this cycle until the filter is clean and then change the oil and filter after 1000 hours of service or more often depending on conditions.

Draining

Drain the transmission by removing the drain plug with the magnet at the rear side of the bottom cover.

Oil Suction Strainer

Remove and clean the pump suction strainer at every oil change or sooner if necessary. The suction strainer is located at the lower end of the pump. [See Engineering Drawings for suction strainer location.](#)

Type Oil Recommended

[See Description and Specifications.](#)

Filling

1. Remove the filler breather in the top cover of the transmission.
2. Fill the transmission's sump with 50 liters (13.2 U.S. gal) of the proper weight and type oil. See Description and Specifications for oil recommendations.
3. Start the engine and let it idle with transmission in Neutral until oil is circulated throughout the hydraulic system. Add oil if necessary to bring the oil level up to the "low" mark with the engine at low idle.
4. With the oil at operating temperature, transmission in Neutral, and the engine running at low idle, check the oil level with the oil gauge. Add or remove oil if necessary to bring the oil level to "FULL" mark on the oil gauge.
5. Allow the oil temperature to cool to normal cold oil conditions (overnight). Check the oil level while cold at low idle engine speed while in Neutral. Make note of the oil level in the cold conditions for future reference, as it corresponds to the correct oil level at operating temperature.

Torsional Coupling

DO NOT obstruct the flywheel housing vents preventing the free flow of air for cooling the coupling. The ambient temperature of the air around the coupling should be between -6°C (22°F) and 80°C (176°F). Assure baffles are installed properly so hot air is ported out of the housing.

Visually inspect the element after the first 100 hours of operation and every 2000 hours thereafter, or every six months, whichever comes first. Torsional vibration, misalignment, degradation by contaminants (oil), heat, ultraviolet radiation, and excessive system torque can cause cracks or other signs of distress to appear on the surface of the rubber. These situations affect the life of the coupling element.

When inspecting the flexible coupling, look for evidence or conditions identified in the following steps:

- ☐ Cracks in the surface of the rubber. May be caused by torsional vibrations, excessive misalignment or exposure to contaminants (heat, petroleum products, chemicals, ozone, ultraviolet radiation) excessive system torques.
- ☐ Separation of rubber from flex plate on coupling plate or deterioration of the rubber-to-metal bond. See above.
- ☐ Deterioration of the rubber element, as evidenced by sponginess or by black carbon-like dust on rubber surface. May be caused by contaminants or excessive heat, either external or internal to the coupling.
- ☐ Cracked, bent or otherwise damaged flex plate or coupling plate.
- ☐ Bolt holes in flex plate or coupling plate elongated oval shaped, not round. This could be caused by improperly assembled parts, loose parts, vibration or improperly torqued parts.
- ☐ Bolts/nuts—bent, worn or stripped threads.

Inspect the hub, looking for the following:

- ☐ Damaged or worn splines.
- ☐ Cracked parts.
- ☐ Oil seal surface for wear or damage.

Replace any defective parts including defective fasteners.

Heat Exchanger Check

Heat exchangers furnished by Twin Disc to be used for salt water applications have zinc rods installed at the inlet and outlet heads. These rods must be checked every 90 days. If over 50% of the rod is disintegrated, it should be replaced to provide effective protection.

Excessive corrosion of the zinc rod indicates electrolytic action. A careful inspection should be made to determine if this action is caused by a short circuit or external grounded electric current. If these conditions do not exist, it is evident that the corrosion is due to local electrolysis. If rods are corroded with foreign materials, they should be cleaned with a wire brush.

In-Boat Repair

Certain transmission maintenance/repair procedures can be accomplished in the boat provided sufficient space exists to work. These procedures are:

- ☐ Removing and installing the oil pump.
- ☐ Changing the filter.
- ☐ Removing, cleaning and installing the suction strainer.
- ☐ Removing and installing the control valve.
- ☐ Removing and installing the manifold.

Overhaul Interval

A complete overhaul of the unit should be made at the same time the engine is overhauled.

Periodic Visual Inspection

- ☐ Check the mounting for tightness or damage such as cracks. Tighten loose mountings and replace damaged parts.
- ☐ Check pressure and temperature gauge where applicable.
- ☐ Inspect the oil lines and heat exchanger for leaky connections, cracks, or other damage. Replace damaged lines.
- ☐ Periodically, inspect the drive line and the input and output shaft oil seals for leakage. Replace parts as required.

Troubleshooting

Troubleshooting with Valves other than GP Control Valve

Note: Some of the troubleshooting procedures vary, depending on the type of control valve that is installed on the transmission. A thorough understanding of the valve operation is important to properly troubleshooting the problem that is occurring.

The following charts are intended as a guide for determining the cause of problems that could be encountered and the corrective actions for those difficulties.

The transmission is one part of a complete power package. Problems in the input power system or the output power delivery components can cause problems to develop in the transmission. It is therefore important that the entire power package be considered when problems are encountered.

The troubleshooting chart for all but the optional GP Control Valve begins on the next page, followed by troubleshooting information for the GP control Valve.

Note: Later transmissions may have model EC050 controls replacing the profile and e-troll modules that are discussed in this manual. See EC050 Control manual #1022756 for operational and diagnostic functions, and installation issues.

Table 9. Troubleshooting Chart

Symptom	Cause		Remedy	
1. Low main oil pressure	1-1	Partially clogged oil strainer	1-1	Remove and clean oil strainer.
	1-2	Stuck pressure regulation piston.	1-2	Disassemble the valve and clean the piston.
	1-3	Broken piston rings on clutch shaft(s).	1-3	Remove the collector and inspect piston rings.
	1-4	Damaged or worn oil pump assembly.	1-4	Replace damaged or worn oil pump assembly (pump is not serviceable)
	1-5	Incorrect linkage adjustment to control valve assembly.	1-5	Adjust linkage so that control valve stem is indexed properly by detent.
	1-6	Clogged or plugged orifice in orifice plate of control valve assembly.	1-6	Remove orifice plate cover. Clean parts.
	1-7	Shimming required between regulator springs and rate-of-rise piston.	1-7	Shim as required.
	1-8	Engine idle speed too low.	1-8	Raise engine speed.
2. No oil pressure, or erratic low pressure at control valve tap.	2-1	Oil pump suction strainer plugged.	2-1	Remove and clean strainer.
	2-2	Oil level low.	2-2	Check oil level and correct.
	2-3	Air leak on suction side of pump.	2-3	Correct cause of air leak.
	2-4	Pump drive on reverse clutch shaft broken.	2-4	Disassemble and repair as required.
	2-5	Regulating valve stuck in open position	2-6	Remove, disassemble, clean and repair the regulating valve.
	2-6	Oil pump defective	2-7	Replace oil pump.
	2-7	Leaking heat exchanger has caused oil to be lost over board.	2-7	Replace heat exchanger

Table. 9. Troubleshooting Chart (continued)

Symptom	Cause	Remedy
3. High main oil pressure.	3-1 Regulating valve stuck.	3-1 Remove and clean regulating valve.
	3-2 Improperly shimmed.	3-2 Shim as required.
	3-3 Lube relief valve malfunction.	3-3 Inspect, repair or replace parts as necessary.
4. High temperature.	4-1 Improper oil level.	4-1 Check and fill (or drain) with proper oil to the correct level.
	4-2 Faulty heat exchanger	4-2 Inspect, repair, or replace heat exchanger.
	4-3 Clutches slipping	4-3 Check clutch apply oil pressure. If pressure is normal, remove, disassemble, and repair slipping clutch.
	4-4 Bearing failure.	4-4 Overhaul marine transmission.
	4-5 Air leak on suction side of pump.	4-5 Inspect and correct cause of suction leak.
	4-6 Control valve malfunction	4-6 Inspect, repair, or replace control valve.
5. Excessive Noise	5-1 Bearing failure.	5-1 Overhaul marine transmission.
	5-2 Worn or damaged input coupling.	5-2 Remove marine transmission. Replace a worn or damaged coupling.
	5-3 Excessive torsional vibration.	5-3 Select proper torsional coupling.
	5-4 Worn or damaged gears.	5-4 Overhaul marine transmission.
	5-5 Improper alignment.	5-5 Check alignment of engine and transmission output flange to propeller shaft. Correct as necessary.
	5-6 Damaged propeller.	5-6 Repair propeller.
	5-7 Misfiring engine.	5-7 Repair engine.

Table. 9. Troubleshooting Chart (continued)

Symptom	Cause	Remedy
6. No neutral.	6-1 Clutch plates warped.	6-1 Remove clutch plates. Overhaul unit.
	6-2 Control valve incorrectly indexed.	6-2 Check and adjust control linkage.
	6-3 Solenoid malfunction (units equipped with electric selector valve)	6-3 Replace defective solenoid.
	6-4 Hydraulic lock piston stuck (units equipped with electric selector valve and hydraulic lock).	6-4 Inspect, repair, or replace hydraulic lock spool.
7. Harsh engagement.	7-1 Regulating piston or rate-of-rise piston stuck.	7-1 Disassemble control valve. Clean parts. Replace parts if necessary.
	7-2 Orifice plate ball in control valve not seating properly.	7-2 Remove orifice plate cover. Clean parts. Replace parts if necessary.
	7-3 Blown gasket on either side of orifice plate.	7-3 Replace gasket.
8. Low lube oil pressure.	8-1 Pump flow output too low.	8-1 Replace pump.
	8-1 Pump suction strainer plugged.	8-2 Remove, clean, inspect, and install the suction screen.
	8-3 Air leak on suction side of pump.	8-3 Inspect and correct cause of suction leaks.
	8-4 Lube relief valve malfunction.	8-4 Remove and clean or replace parts as necessary.
	8-5 Broken piston rings.	8-5 Replace damaged piston rings.
9. Oil spilling out of breather.	9-1 Oil level too high.	9-1 Adjust oil level.
	9-2 Wrong type of oil.	9-2 Draw and refill with recommended oil.

Troubleshooting of GP Control Valve with Electronic Interface

The transmission is one part of a complete power package. Problems in the input power system or the output power delivery components can cause problems to develop in the transmission. It is therefore important that the entire power package be considered when problems are encountered.

Electronic Interface LED Indicators

The electronic interface control modules have one green and two red led indicator lights. The green power light is illuminated only when the transmission is in gear.

The following table lists the reasons for the various conditions where lights are illuminated. This should guide in troubleshooting problems. See the wiring schematics in the Installation Section.

[Troubleshooting Tables begin on the next page.](#)

Table 10. LED Light Status

Light Status	Profile Generator (Non trolling)	E-troll Module
Green light on	Supply Voltage > 9.0 Volts	Supply Voltage > 9.0 Volts
Red light on	Valve coil commanded on	Valve coil commanded on
One red light flashing	Open circuit in an energized valve coil circuit, Valve coil leads shorted together, or Low coil current	Open circuit in an energized valve coil circuit, or Valve coil leads shorted together, or Low coil current
Both red lights flashing simultaneously	Power is applied to Solenoid A and B switch inputs at the same time.	After entering troll from neutral with both voltage and current troll speed signals present, or power is applied to Solenoid A and B switch inputs at the same time.
Both red lights flashing alternately	Not applicable	Either or both speed signals missing.

Table 11. Troubleshooting Chart --- GP Valve Equipped Transmissions

Symptom	Cause	Remedy
1. Low main oil pressure	1-1 Partially clogged oil strainer	1-1 Remove and clean oil strainer.
	1-2 Contamination on Pilot Relief Valve seat.	1-2 Disassemble the Pilot Relief Valve and clean. Service the transmission oil filter.
	1-3 Contamination in Main Valve Cartridge	1-3 Clean or replace the Main Valve Cartridge, and service the transmission oil filter.
	1-4 Broken piston rings on clutch shaft(s).	1-4 Remove the collector and inspect piston rings.
	1-5 Damaged or worn oil pump assembly.	1-5 Replace damaged or worn oil pump assembly (pump is not serviceable).
	1-6 Engine idle speed too low.	1-6 Raise engine speed.
2. No oil pressure, or erratic low pressure at control valve.	2-1 Oil pump suction strainer plugged.	2-1 Remove and clean strainer.
	2-2 Oil level low.	2-2 Check oil level and correct.
	2-3 Air leak on suction side of pump.	2-3 Correct cause of air leak.
	2-4 Pump drive on reverse clutch shaft broken.	2-4 Disassemble and repair as required.
	2-5 Pilot Relief Valve or Main Regulating Valve stuck in open position	2-6 Remove, disassemble, clean and repair the Pilot Relief Valve. Remove, clean, or replace the Main Regulating valve. This valve cannot be disassembled.
	2-6 Oil pump defective	2-7 Replace oil pump.
	2-7 Leaking heat exchanger has caused oil to be lost over board.	2-7 Replace heat exchanger

Table 11. Troubleshooting Chart (continued)--- GP Valve Equipped Transmissions

Symptom	Cause	Remedy
3. High main oil pressure.	3-1 Pilot Relief Valve out of adjustment..	3-1 Adjust the Pilot Relief Valve. Replace if necessary.
	3-2 Main Regulating Valve orifice missing.	3-2 Replace Main Regulating Valve Cartridge.
4. High temperature.	4-1 Improper oil level.	4-1 Check and fill (or drain) with proper oil to the correct level.
	4-2 Faulty heat exchanger	4-2 Inspect, repair, or replace heat exchanger.
	4-3 Clutches slipping	4-3 Check clutch apply oil pressure. If pressure is normal, remove, disassemble, and repair slipping clutch. If pressure is low, replace Proportional Valve, and service transmission oil filter.
	4-4 Bearing failure.	4-4 Overhaul marine transmission.
	4-5 Air leak on suction side of pump.	4-5 Inspect and correct cause of suction leak.
	4-6 Control valve malfunction	4-6 Inspect, repair, or replace control valve.
5. Excessive Noise	5-1 Bearing failure.	5-1 Overhaul marine transmission.
	5-2 Worn or damaged input coupling.	5-2 Remove marine transmission. Replace a worn or damaged coupling.
	5-3 Excessive torsional vibration.	5-3 Select proper torsional coupling.
	5-4 Worn or damaged gears.	5-4 Overhaul marine transmission.
	5-5 Improper alignment.	5-5 Check alignment of engine and transmission output flange to propeller shaft. Correct as necessary.
	5-6 Damaged propeller.	5-6 Repair propeller.
	5-7 Misfiring engine.	5-7 Repair engine.

Table 11. Troubleshooting Chart (continued)--- GP Valve Equipped Transmissions

Symptom	Cause	Remedy
6. No neutral.	6-1 Clutch plates warped.	6-1 Remove clutch plates. Overhaul unit.
	6-2 Disengaged clutch has apply pressure.	6-2 Replace Proportional Valve. Service transmission oil filter.
7. Harsh engagement.	7-1 Faulty Proportional Valve.	7-1 Replace Proportional Valve.
	7-2 Faulty Temperature Sensor (if equipped).	7-2 Replace Temperature Sensor.
	7-3 Profile Generator defective or out of adjustment.	7-3 Replace Profile Generator. Adjust if proper equipment is available.
8. Low lube oil pressure.	8-1 Pump flow output too low.	8-1 Replace pump.
	8-1 Pump suction strainer plugged.	8-2 Remove, clean, inspect, and install the suction screen.
	8-3 Air leak on suction side of pump.	8-3 Inspect and correct cause of suction leaks.
	8-4 Lube relief valve malfunction.	8-4 Remove and clean or replace parts as necessary.
	8-5 Broken piston rings.	8-5 Replace damaged piston rings.
9. Oil spilling out of breather.	9-1 Oil level too high.	9-1 Adjust oil level.
	9-2 Wrong type of oil.	9-2 Draw and refill with recommended oil.
10. Low Clutch Apply Pressure	10-1 Low Main Pressure	10-1 See Paragraph 1.
	10-2 Defective Proportional Valve.	10-2 Replace Proportional Valve
	10-3 Low voltage to Profile Generator	10-3 Verify that green (voltage supply) light, and red (clutch energized) lights are bright

Disassembly

General

Note: During the service of this unit, all O-rings, gaskets and seals must be replaced. It is good practice to keep the used components (O-rings, gaskets, and seals) with the appropriate components for reference during the inspection and assembly process (to make sure you don't forget the quantity, size, etc.).

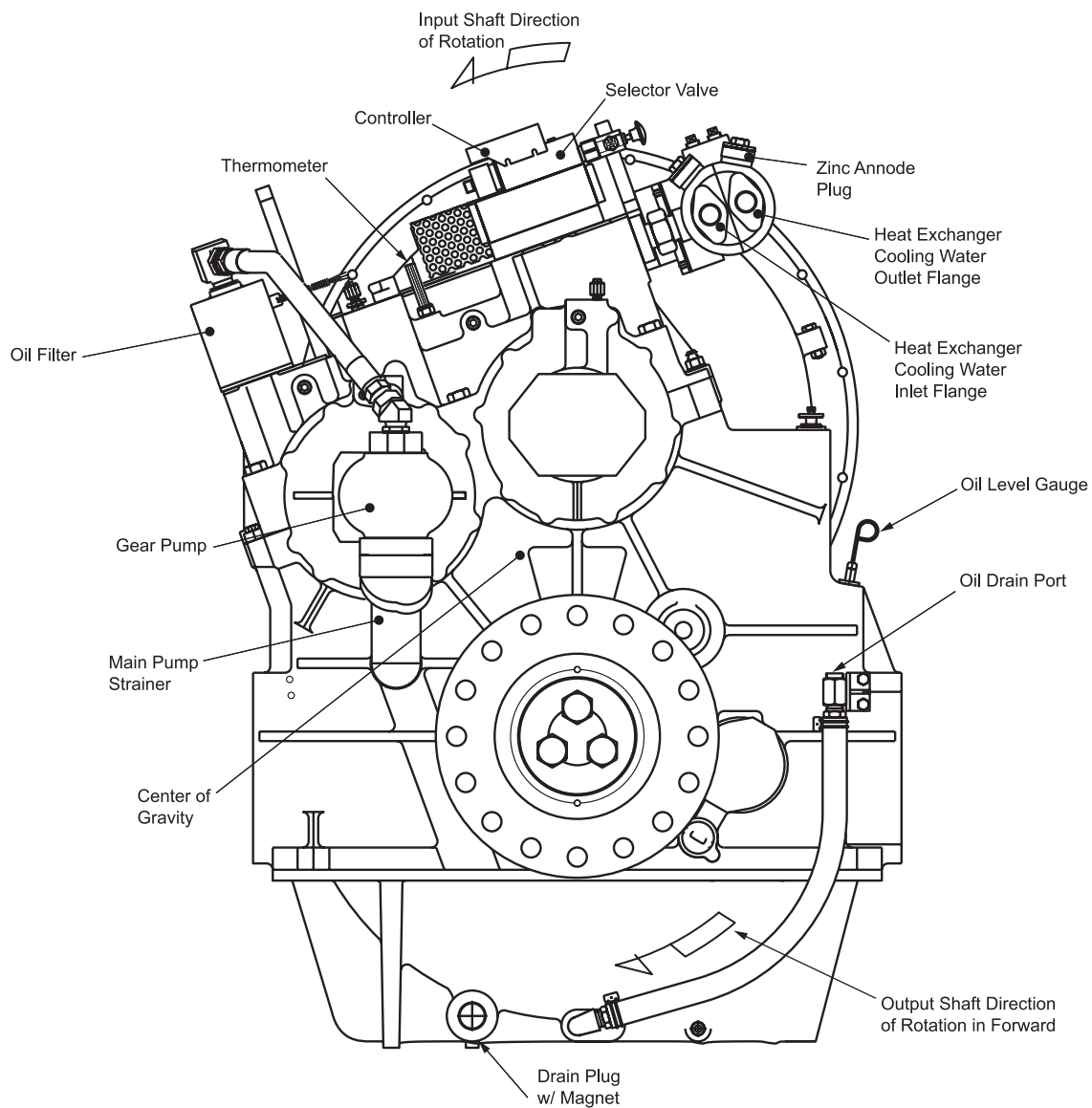
CAUTION

Flat washers are used under all fasteners where the head of the fastener contacts an aluminum surface.

Pipe threads called out as PT (British Standard Pipe Taper) on drawings and in this text are different from NPT threads. PT threads and NPT threads are NOT interchangeable. Adapters are available from several manufacturers to convert PT threads to NPT threads.

Most pusher screws used in the disassembly of this transmission are threaded through aluminum parts. **ALWAYS LUBRICATE** the threads of the pusher screw before threading it into the mating part. When installing pusher screws, avoid rapid tightening with an impact wrench or similar device. If an impact wrench is used with the pusher screws the threads may gall or seize in the aluminum part. Tighten pusher screws in an even manner to avoid damaging components.

Component Identification



ID-MG5506

Figure 24. MG-5506 Component Identification and Location

Drain Oil

Transmission Sump

Drain the oil from the transmission sump by removing the 1 1/2 BSPT (British Standard Pipe - Taper) plug from the transmission bottom housing.

Heat Exchanger and Hoses

1. Drain the oil from the heat exchanger by removing the taper plug from the bottom of the heat exchanger cover.
2. Remove the braided oil hose (1) located between the oil filter inlet and the pump outlet and the drain hose (2) to the sump.

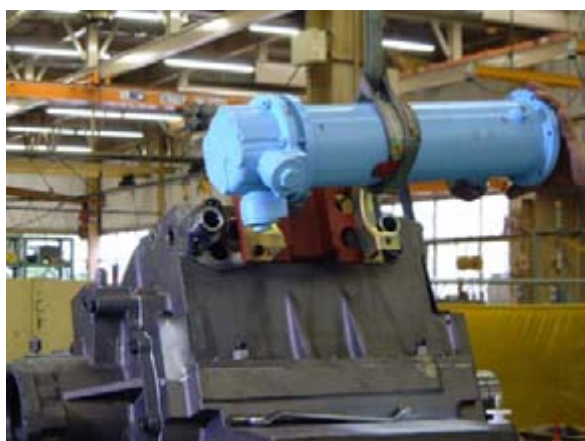


B001-5506 B002-5506

Figure 25. Hose Removal

Remove External Components

1. Remove the two U-bolts and retaining nuts holding the heat exchanger (1) on the U-bolt mounting base.
2. Remove the heat exchanger (1).
3. Remove the U-bolt mounting base and M10 x 20 capscrews from the mounting bracket.
4. Remove the heat exchanger mounting bracket and M16 x 45 capscrews.
5. Remove the oil filter (2) from the mounting bracket (3).
6. Remove the mounting bracket (3) and M12 x 25 capscrews with washers.



B003-5506



B006-5506

Figure 26. Heat Exchanger and Oil Filter Removal

7. Remove electrical connections, and loosen or remove four M-6 capscrews that retain the electronic interface module (if equipped).
8. GP Valve Assembly: Remove the six M10-1.50 x 70 capscrews and remove the top valve body (4) and gasket. Mechanical Control Valve: Remove three M10 x 105 and one M10 x 90 capscrews and remove the valve assembly. Electric Control Valve: Remove four M10 x 145 capscrews and remove both valve sections.
9. GP Valve Assembly: Remove the four capscrews that retain the selector valve body to the transmission, and remove the valve body and gasket (5).
10. Remove the inspection cover (6) and M10 capscrews.



B004-5506



B005-5506

Figure 27. Controller and Selector Valve Removal

11. Remove the bolts holding the strainer housing (7) to the pump assembly, and remove the strainer housing and tube.
12. Remove the nuts and lock washers, and remove the pump assembly and gasket (8) from the pump base.



B007-5506



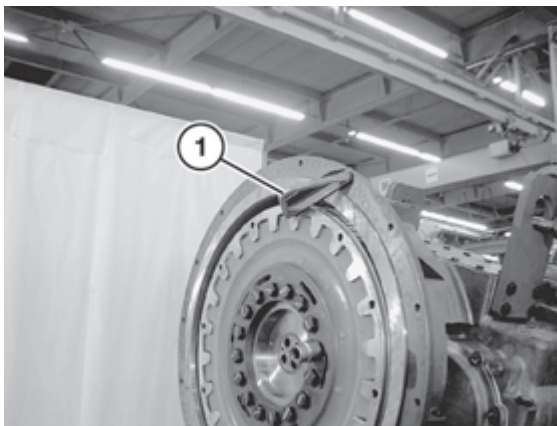
B008-5506

Figure 28. Strainer Case and Gear Pump Removal

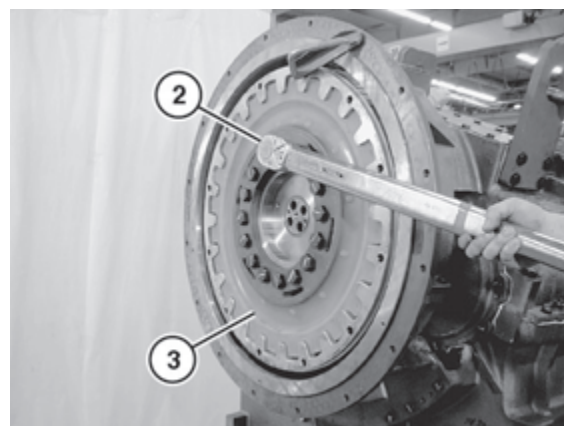
13. Remove the four 1/2-13 x 28 mm capscrews and remove the primary shaft rear cover.
14. Remove the nine M12 x 35 capscrews, and remove the pump base and seal rings from the secondary shaft.

Flexible Coupling Disassembly

1. Install special tool (1) to restrain the coupling from rotation.
2. Remove sixteen M22 x 90 capscrews (2) securing the flexible coupling (3) to the input flange.
3. Remove the driving ring.
4. Remove the flexible coupling (3) and adapter/spacer (4).



AS112-5506



AS113-5506

Figure 29. Flexible Coupling Removal



B010-5506

Figure 30. Adapter Ring Removal

5. Remove the M10 x 25 socket head capscrews securing the pilot ring (5) to the front housing.
6. Remove the M12 x 35 and M12 x 60 capscrews securing the front housing (6) to the main housing. Install pusher bolts, support front housing with a hoist (7), and remove front housing.



B011-5506



B012-5506

Figure 31. Collar and Front Housing Removal

Input Hub Disassembly

1. Remove the taper thread plugs (1) from the end of the input shaft.
2. Insert the oil injection adaptor tool (2) (T-21482-8) into the oil injection port (3) (the shallower hole).
3. Install a retaining plate and capscrew (4) to prevent the input hub from coming completely off of the shaft. Fill the tool and shaft hole with SAE40W oil.

Note: It may be necessary to tilt the unit toward its back side to facilitate filling the tool with oil.



B013-5506



B014-5506

Figure 32. Taper Plug and Input Hub Removal

4. Wrap the injection adaptor screw threads with teflon tape. Hold the injection tool to prevent rotation, and use an impact wrench to drive the screw into the oil injector adapter until the input hub and input shaft separate.

If the input hub and input shaft do not separate, repeat steps 3 and 4.

⚠ WARNING

The input hub and shaft will separate with extreme force, potentially causing great physical harm. Use **EXTREME CAUTION** and proper safety procedures.

Primary and Secondary Shaft Removal

1. Remove the eight M12 capscrews securing the input seal carrier (1) to the housing. Remove the input seal carrier (1).
2. Wrap the area (2) on the input shaft which contacts the oil seal lip with vinyl tape to prevent scratches.
3. Remove the eight M12 capscrews securing the end cover to the housing. Remove the secondary shaft end cover (3) from the housing.



B015-5506



B016-5506

Figure 33. Input Seal Carrier and End Cover Removal

4. Remove the two M12 capscrews securing the supply cover to the pump base (4).
5. Remove the pump base (4).
6. Remove the shim pack (5). Mark the shim pack for future identification and set aside.



B017-5506

Figure 34. Pump Base and Shim Pack Removal

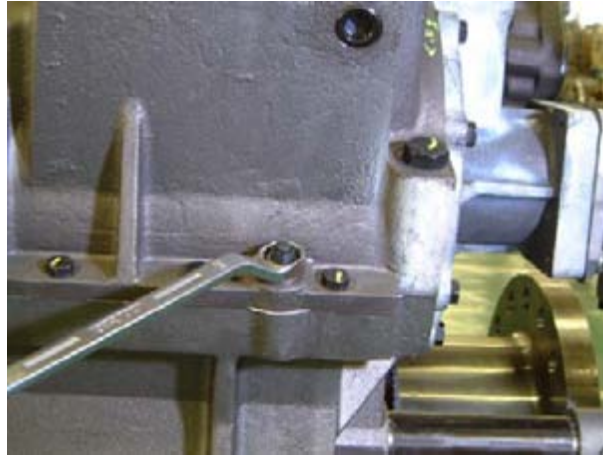
7. Install pinion retainers (6) on the shafts. Tighten the bolts to keep the bearing outer races in place, thus retaining the pinion.



B019-5506

Figure 35. Pinion Retainer Installation

8. Tighten the nuts on the alignment pins, and remove the alignment pins (7).



B020-5506

Figure 36. Alignment Pin Removal

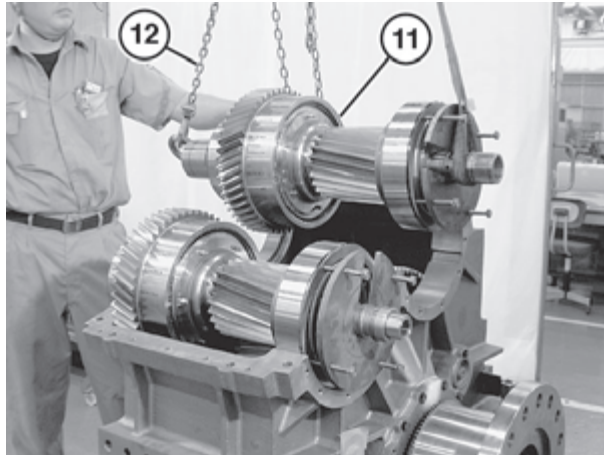
9. Remove the M12 x 1.75 bolts securing the top housing (9) to the lower housing. Install eyebolts (8) and lift up the housing (9) with a hoist (10).



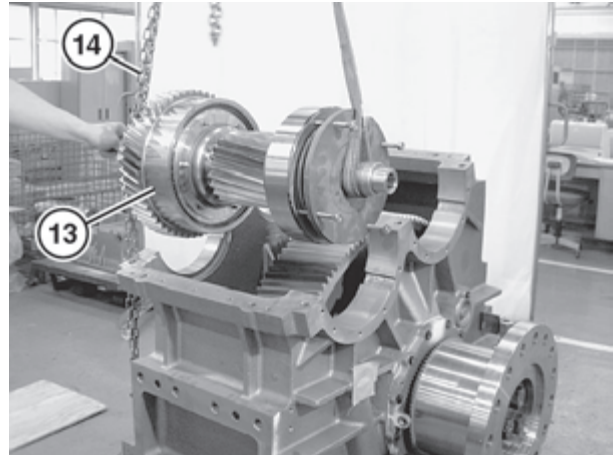
B021-5506

Figure 37. Housing Removal

10. Remove the primary shaft (11) with a hoist (12).
11. Remove the secondary shaft (13) with a hoist (14).



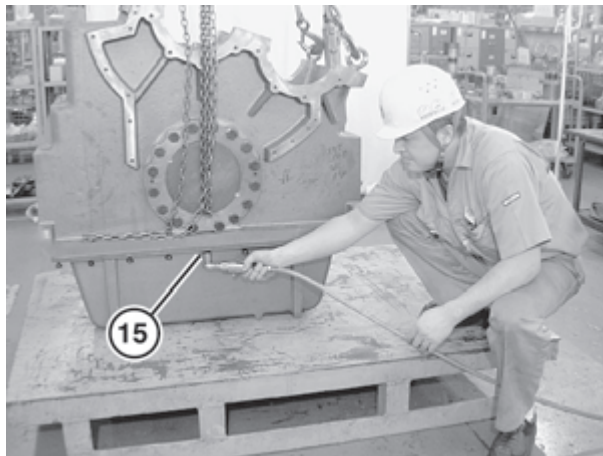
AS068-5506



AS067-5506

Figure 38. Primary and Secondary Shaft Removal

12. Remove twenty four M12 x 35 capscrews (15) that retain the bottom pan to the housing.
13. Use a hoist and raise the housing (16) from the bottom cover (17).



AS066-5506



B024-5506

Figure 39. Housing Removal

Output Shaft Disassembly

1. Remove the bolts and washers (1).
2. Remove the 1/4 BSP threaded plug from the end of the output shaft.
3. Insert the oil injection adaptor tool (2) (T-21482-8) into the port (3) (the shallower hole).
4. Install a retaining plate and capscrew (4) to prevent the output flange from coming completely off of the shaft.

Note: It may be necessary to tilt the unit toward the front to facilitate filling the tool with oil.

5. Wrap the injection adaptor screw threads with teflon tape. Fill the tool with SAE40W oil.
6. Hold the injection tool (5) to prevent rotation, and use an impact wrench to drive the screw into the injector adapter until the output flange and output shaft separate. If the output flange and output shaft do not separate, repeat steps 5 and 6.



B025-5506



B026-5506

Figure 40. Output Shaft Removal

⚠ WARNING

The output flange and shaft will separate with extreme force, potentially causing great physical harm. Use **EXTREME CAUTION** and proper safety procedures.

7. Remove the twelve M12 x 35 capscrews, and remove the seal carrier (6) from the housing assembly.
8. Wrap the area (7) on the output shaft which contacts the oil seal lip with vinyl tape to prevent scratches.



B027-5506

Figure 41. Pump Drive Shaft Cover Removal

9. Rotate the housing with the output end down. Block the housing, allowing clearance below the end of the output shaft.
10. Remove 16 M20 x 60 capscrews, and remove the front output shaft cover (8). Carefully remove the cover as the eight (six springs on assembly 739380) springs will remain on top of the bearing spacer and shims (assembly 739380 and 739582).



B028-5506

Figure 42. Output Shaft Cover Removal

Note: Assemblies 739380 and 739582 have two spacers with shims between the springs and the bearing race. Assembly 739688 has a spacer between the springs and the bearing race, with shims between the housing and the end cover. Assembly 00D005604 has shims between the housing and the end cover, and the springs are positioned against the bearing race.

11. Remove the springs and shim pack (9). Remove the bearing thrust race.



B030-5506

Figure 43. Shim Pack Removal

12. Remove the three M30 x 75 capscrews holding the washer (10) to the output shaft. Assembly 00D005604 has M30 x 85 capscrews.
13. Remove the washer.



B031-5506

Figure 44. Washer Removal

14. Remove the taper thread plugs from the end of the output shaft.
15. Insert the oil injection adaptor tool (T-21482-8) (11) into the oil injection port (the deeper hole). Fill the tool with SAE40W oil.
16. Wrap the injection adaptor screw thread with teflon tape.
17. Place two angle iron pieces under the gear (12), allowing clearance for the gear to fully be removed from the shaft.



B032-5506



B033-5506

Figure 45. Output Gear Removal

18. Hold the injector tool (11) to prevent rotation, and use an impact wrench to drive the screw (13) into the oil injector adapter until the output gear separates from the output shaft.

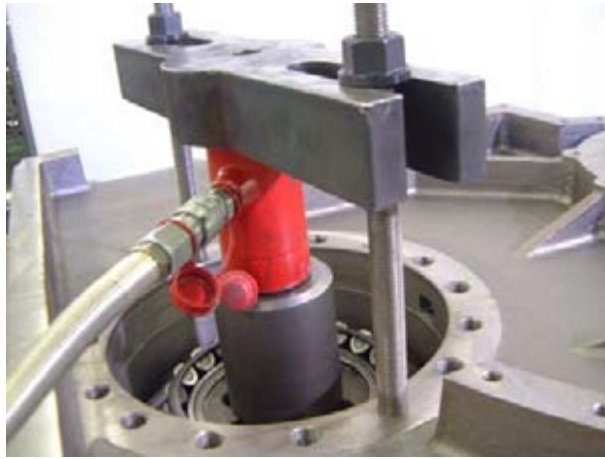
If the output gear and shaft do not separate, repeat steps 16 through 19.

⚠ WARNING

The output gear and shaft will separate with extreme force, potentially causing great physical harm. Use **EXTREME CAUTION** and proper safety procedures.

19. Provide protective blocking so that the output shaft is not damaged when it comes out of the bearings, and install a hydraulic ram (14) with the pusher bar fixed to the housing. Allow the shaft approximately 200 mm clearance for movement. Push the output shaft down until it separates from the bearings.

20. Lift up the housing with a hoist (15). Remove the output shaft assembly. Slide the output gear (16) out from the housing.



B034-5506



B035-5506

Figure 46. Output Shaft Removal

21. Remove the bearings from the housing.
22. Remove the snap ring, and remove the rear output bearing from the shaft.

Clutch Disassembly

Note: Disassembly procedures are nearly identical for both the Primary and Secondary Clutch Assemblies.

1. Remove the pinion retainer (1). Remove the bearing cup. Lift the pinion (2) up with a hoist and set aside for further disassembly.



B019-5506



CLB001-5506

Figure 47. Pinion Retainer and Pinion Removal

2. Remove the taper roller bearing (3) and spring retainer.



CLB002-5506

Figure 48. Taper Roller Bearing and Spring Retainer Removal

3. Remove the wave spring pack (4).

4. Remove the snap ring (5).



CLB003-5506



CLB004-5506

Figure 49. Wave Spring Pack and Snap Ring Removal

5. Remove the backing plate (6).
6. Remove the seven steel plates and the six friction plates (7).



CLB005-5506



CLB006-5506

Figure 50. Backing Plate, Steel Plate and Friction Plate Removal

7. Remove the anti-rotation pin (8).
8. Install two eyebolts (9) into the clutch piston to use as handles. Remove the clutch piston (10). If the piston sticks, apply compressed air to the oil pressure hole on the shaft.



CLB007-5506



CLB008-5506

Figure 51. Knock Pin and Piston Removal

9. Rotate the primary shaft up side down. Install jig (11) to hold the bearing (12). Position clutch housing approximately 220 mm above the table surface.

10. Insert the oil injection adaptor tool (13) (T-21482-8) into the oil injection port (the deeper hole). Fill the tool with SAE40W oil.
11. Wrap the injection adapter screw threads with teflon tape.
12. Tighten the tool (14). Allow the shaft weight to pull the shaft from the bearing.



CLB009-5506



CLB010-5506

Figure 52. Primary Shaft Bearing Removal

13. Repeat steps 9 through 12 to remove the bearing (15) from the secondary shaft. The secondary shaft has only one port for the oil injection adapter tool.



CLB011-5506

Figure 53. Secondary Shaft Bearing Removal

GP Control Valve

1. Disconnect the connectors at the proportional valves, the neutral switch, and the temperature sensor (if equipped), and loosen the four M6-1.0 capscrews that retain the Electronic Interface Module to the Hydraulic portion of the valve assembly. If the Electronic Interface is not being replaced, it can be set aside without disconnecting the remaining wires from the installation.



Figure 54. Electronic Profile Module (typical)

2. Remove the six M10-1.50 x 70 capscrews that retain the top valve body assembly to the transmission, and remove the top valve body assembly with gasket (if not previously removed).

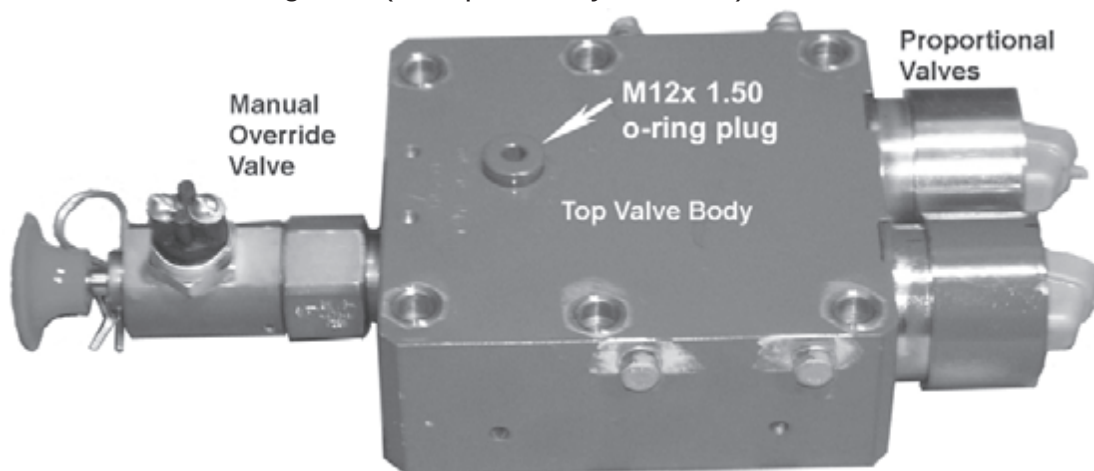


Figure55. Top Hydraulic Valve Body Assembly

3. Remove the four capscrews that retain the main regulator valve assembly to the transmission housing or ditch plate, and remove the valve assembly and gasket (if not previously removed).

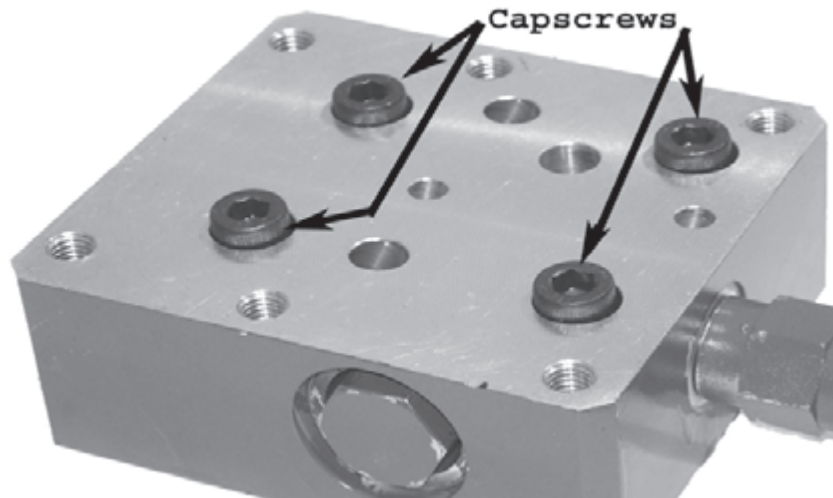


Figure 56. Main Regulator Hydraulic Valve Assembly

4. Remove the Manual Direction Control Valve with switch (if equipped) or the Plug Assembly from the Top Valve Body.

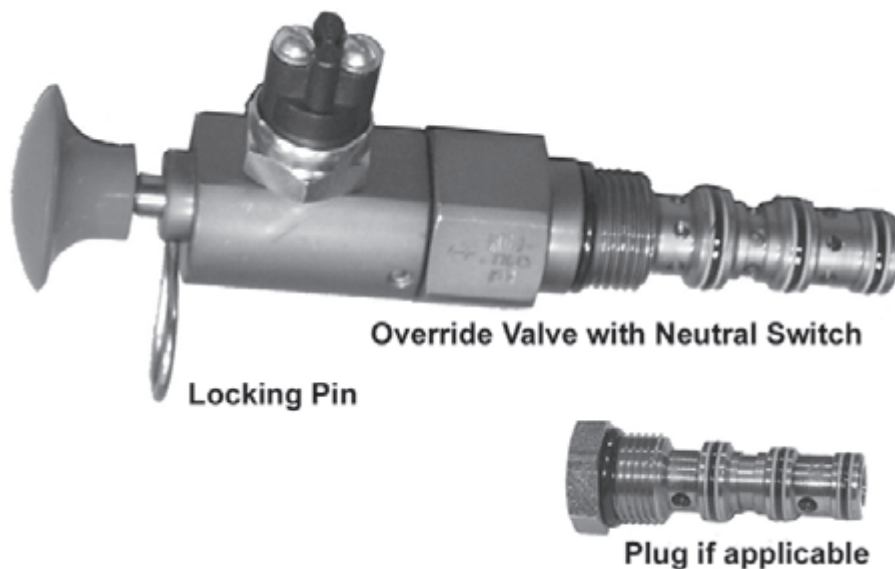


Figure 57. Manual Direction Control Valve or Plug

5. Remove the M6-1.00 x 16 Allen head capscrew, the retaining plate, and the proportional Valve Cartridges from the Top Valve Body. A slight rotating motion while pulling will help to with the removal of the valves.

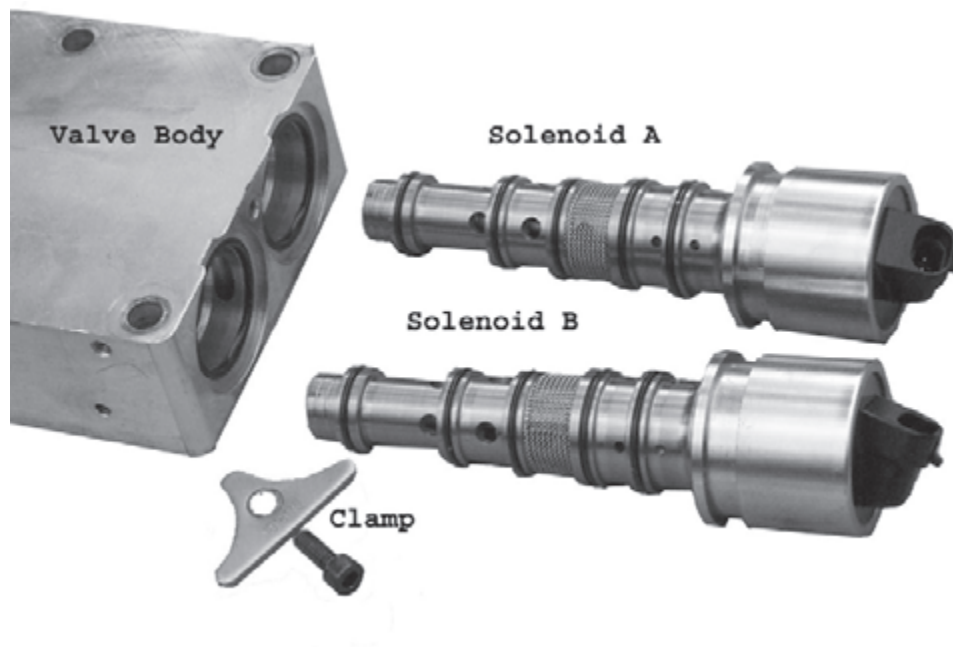


Figure 58. Remove Proportional Valve Cartridges

6. Remove the Main Pressure Regulator from the Main Regulator Valve body.
 - A. Remove the regulator adjusting screw cap, and loosen the jam nut.
 - B. Turn the adjusting screw counter clockwise to reduce the spring load on the valve.
 - C. Evenly loosen the four M-8 x 25 capscrews, and remove the cover assembly and gasket, followed by the spring(s) and spool.
 - D. Remove the four M-8 x 25 capscrews from the opposite end, and remove the cover and gasket.
 - E. Remove the orifice and screen assembly for cleaning.
 - F. Remove the ball check assembly only if necessary. Removal will require destruction and replacement of the assembly.

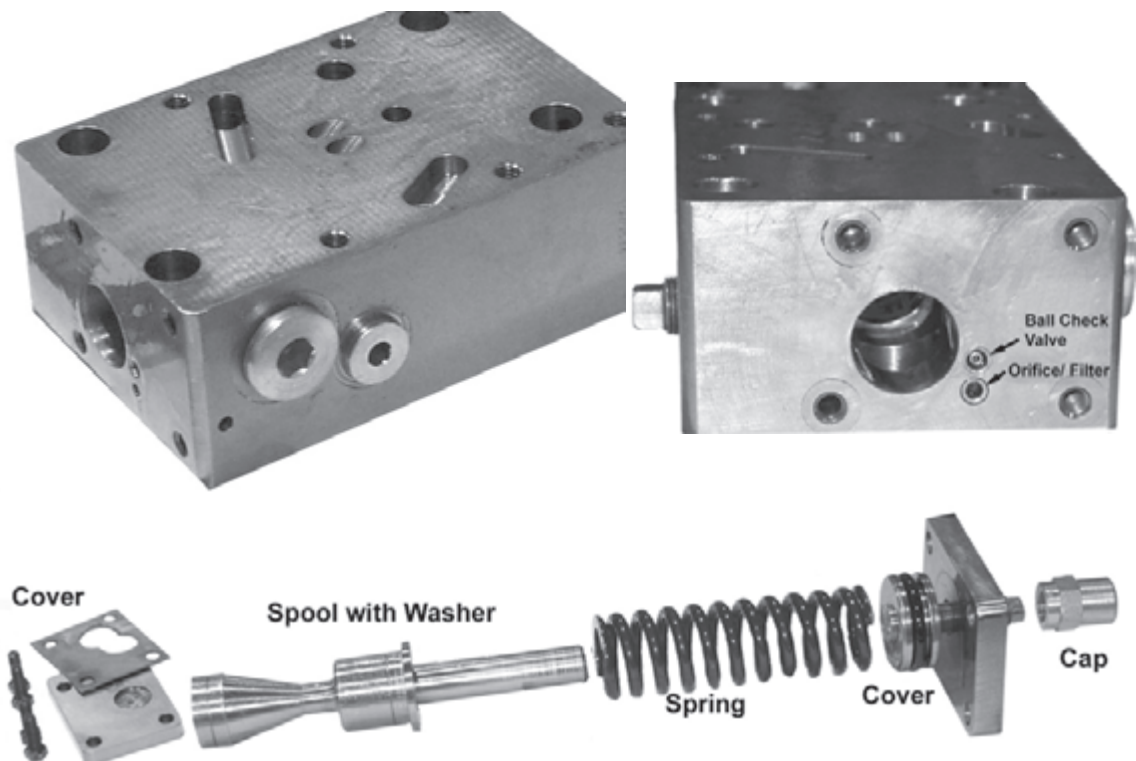


Figure 59. Remove Main Pressure Regulator Valve Components

Disassembly of 1018084 Electric Control Valve

⚠ CAUTION

Steel ball is under pressure from the spring. Care must be taken when removing the cover and orifice plate to prevent loss of steel ball.

1. Loosen and remove four of M8 x 25 socket head capscrews, and remove orifice plate cover and gasket.

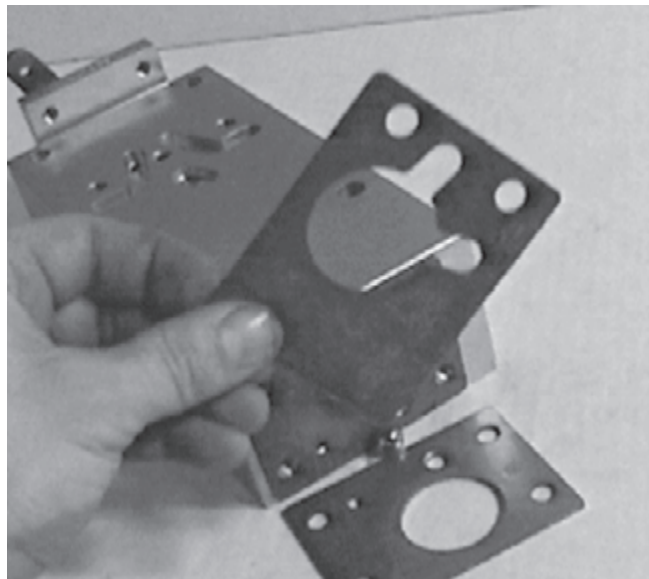


Figure 60. Removing Orifice Plate Cover Gasket

2. Remove orifice plate.
3. Remove steel ball and neutral pressure regulating spring.
4. Remove orifice plate gasket.

5. Remove rate-of-rise piston. Note that shims are located between the piston and springs.

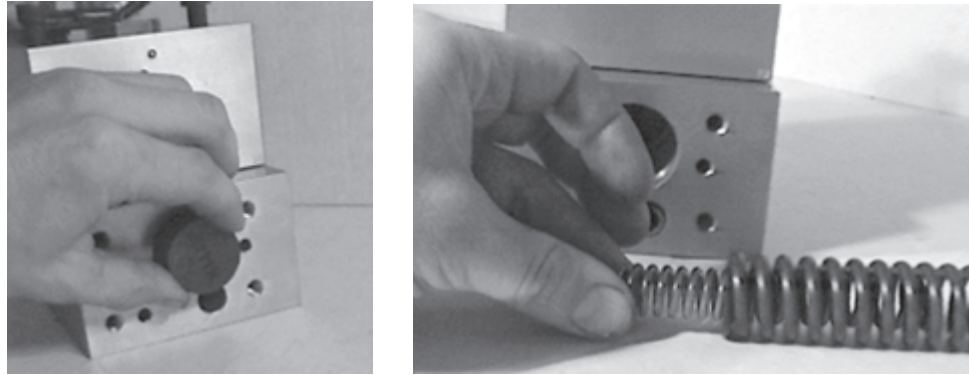


Figure 61. Rate of Rise Piston (left) and Regulator Springs (right)

6. Remove pressure regulating springs.
7. Remove pressure regulating piston with an external retaining ring pliers.

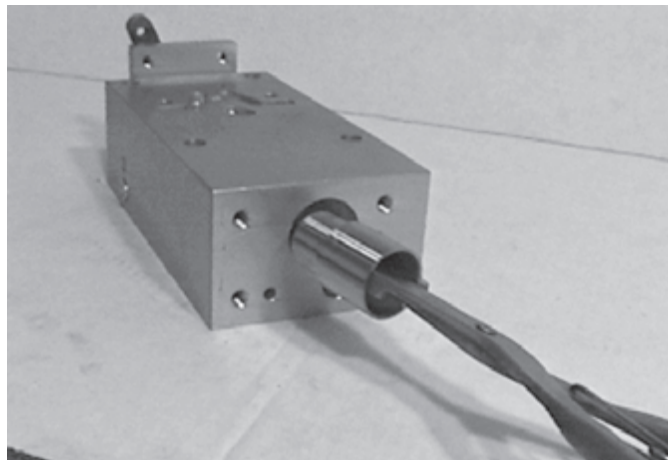


Figure 62. Removing Regulating Piston with Pliers

8. Remove external retaining ring from the lever end of the stem.
9. Loosen the clamping nut and remove the control lever from the stem. It may be necessary to splay the lever to be able to remove it. DO NOT apply any impact force to the lever, as the stem or dog-point setscrew might get damaged.
10. Remove the washer and spring from the stem.

11. Remove four of M8 x 25 socket head capscrews.
12. Remove the cover assembly with gasket from the valve body.
13. Remove the O-ring and oil seal from the cover assembly.

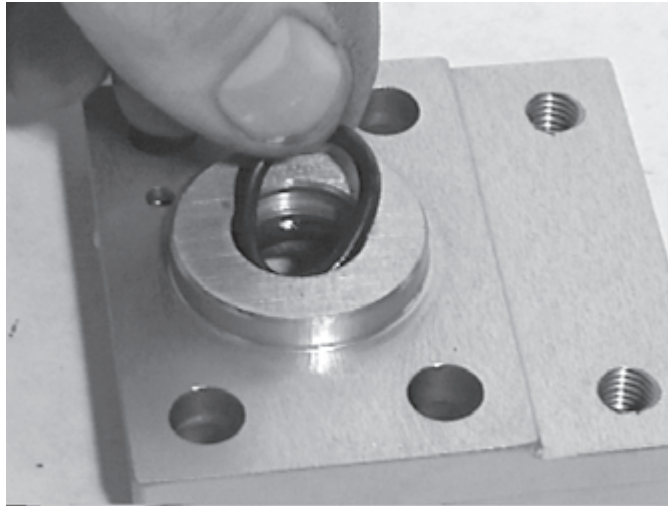


Figure 63. Removing O-ring from Cover

14. Remove the two electrical switches from the sides of the valve body and the two steel balls from each of the switch bores in the valve body (some models).
15. Remove the detent setscrew, spring, and steel ball from the valve body.

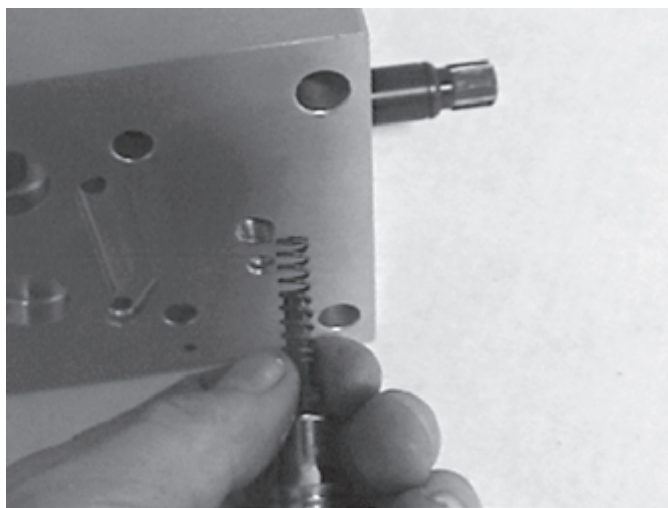


Figure 64. Removing Detent Setscrew and Spring

16. Remove the dog-point setscrew. Note that the setscrew is retained with MA908 threadlocker.

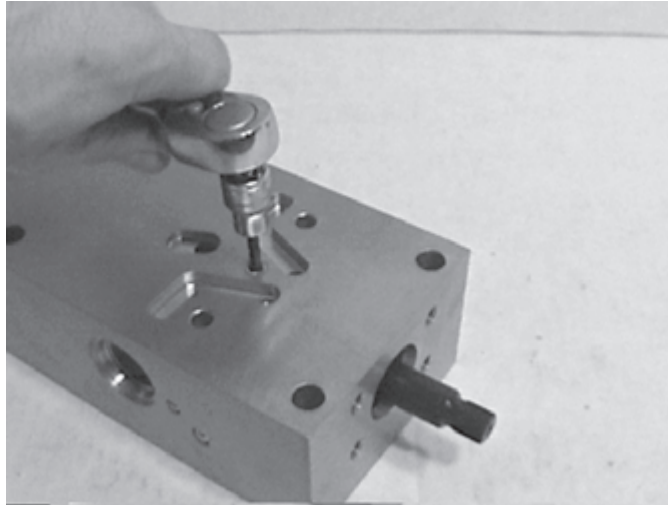


Figure 65. Removing Dogpoint Setscrew

17. Remove the stem from the valve body partially.
18. Remove the thrust washer from the stem.

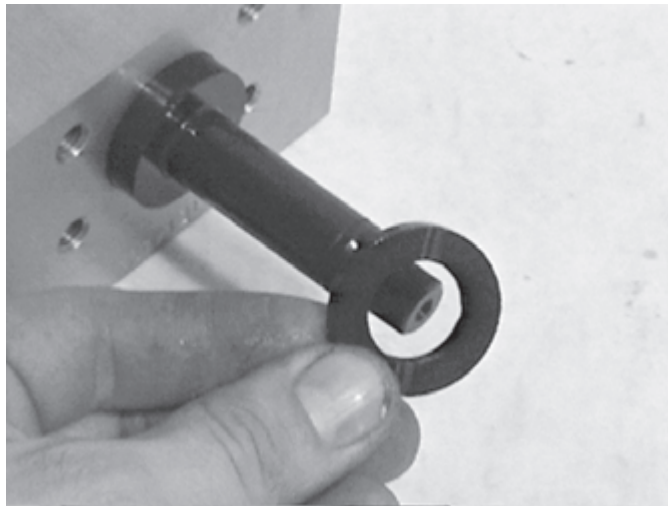


Figure 66. Removing Thrust washer

19. Remove the stem from the valve body.

20. Remove the roll pin (retains the shuttle ball seat) with a needle-nose pliers.

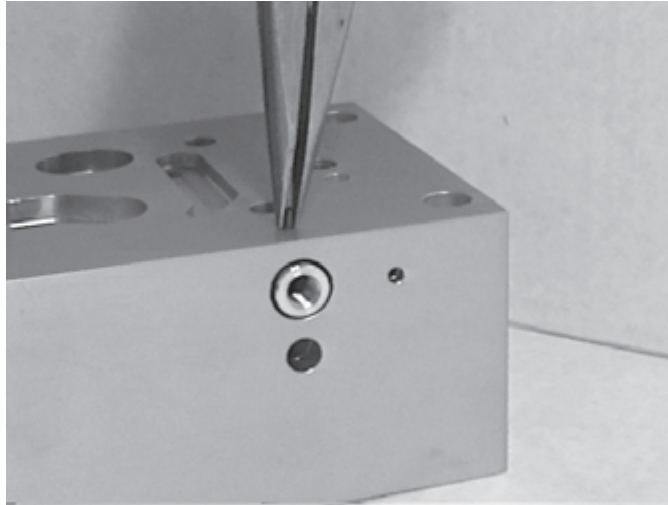


Figure 67. Removing Roll Pin Retaining Shuttle Seat

21. Thread a M8 x 1.25 screw (one of the cover screws works well) into the seat and remove it from the valve body.
22. Remove the shuttle ball from the valve body.

Disassembly of Upper Valve Body Half (electric section)

1. Remove the Weatherpak connector from the valve body by sliding it in the direction of the opening in the shroud.
2. Mark the wires with the location letters that are on the Weatherpak connector. Open the end of the Weatherpak connector to allow removal of the pins and wires.
3. Remove the pins (for the wires of all but one solenoid) from the Weatherpak connector using the extraction tool. Tool is Packard Electric P/N 12014012.

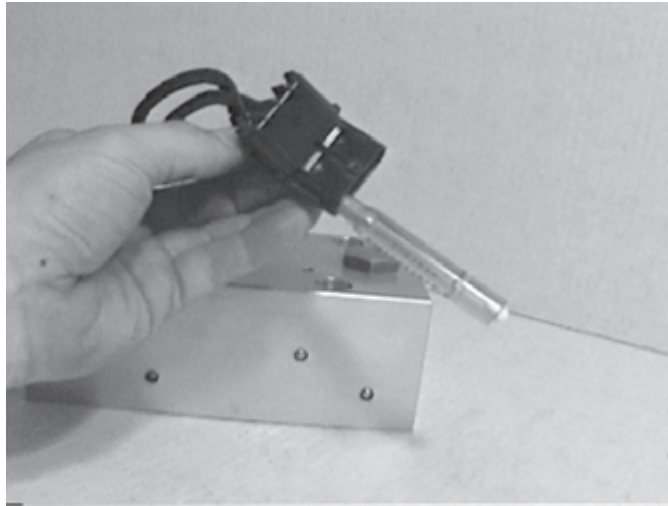


Figure 68. Removing Wires using Extraction Tool

4. Mark the two solenoids for location identification and remove them.
5. Remove the third (Neutral) solenoid (units with hydraulic lock) or plug (units without hydraulic lock).

6. Remove the filter screen from the valve body.

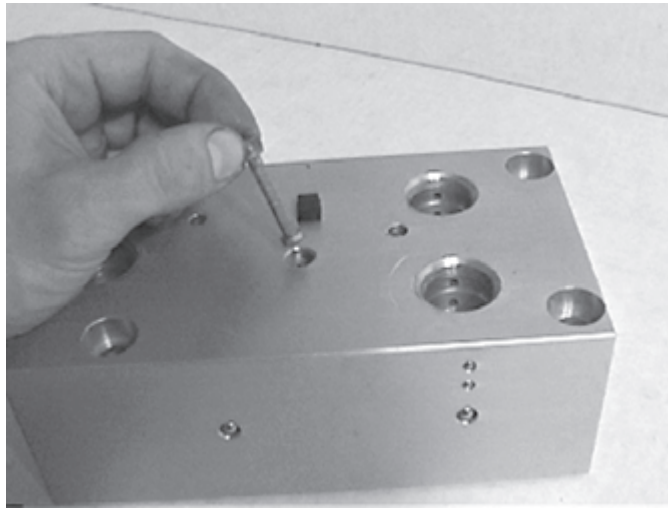


Figure 69. Removing Filter Screen

7. Remove the two socket head O-ring plugs from the bores in the end of the valve body.
8. Remove the two spools from the valve body.
9. Remove one dowel pin and spring from each of the spools (hydraulic lock units only).
10. Remove the spool return spring and dowel pin from the bottom of each of the spool bores in the valve body.

Disassembly of 549453 Mechanical Control Valve

Refer to the cross section drawing as an aid to disassembly of the valve assembly.

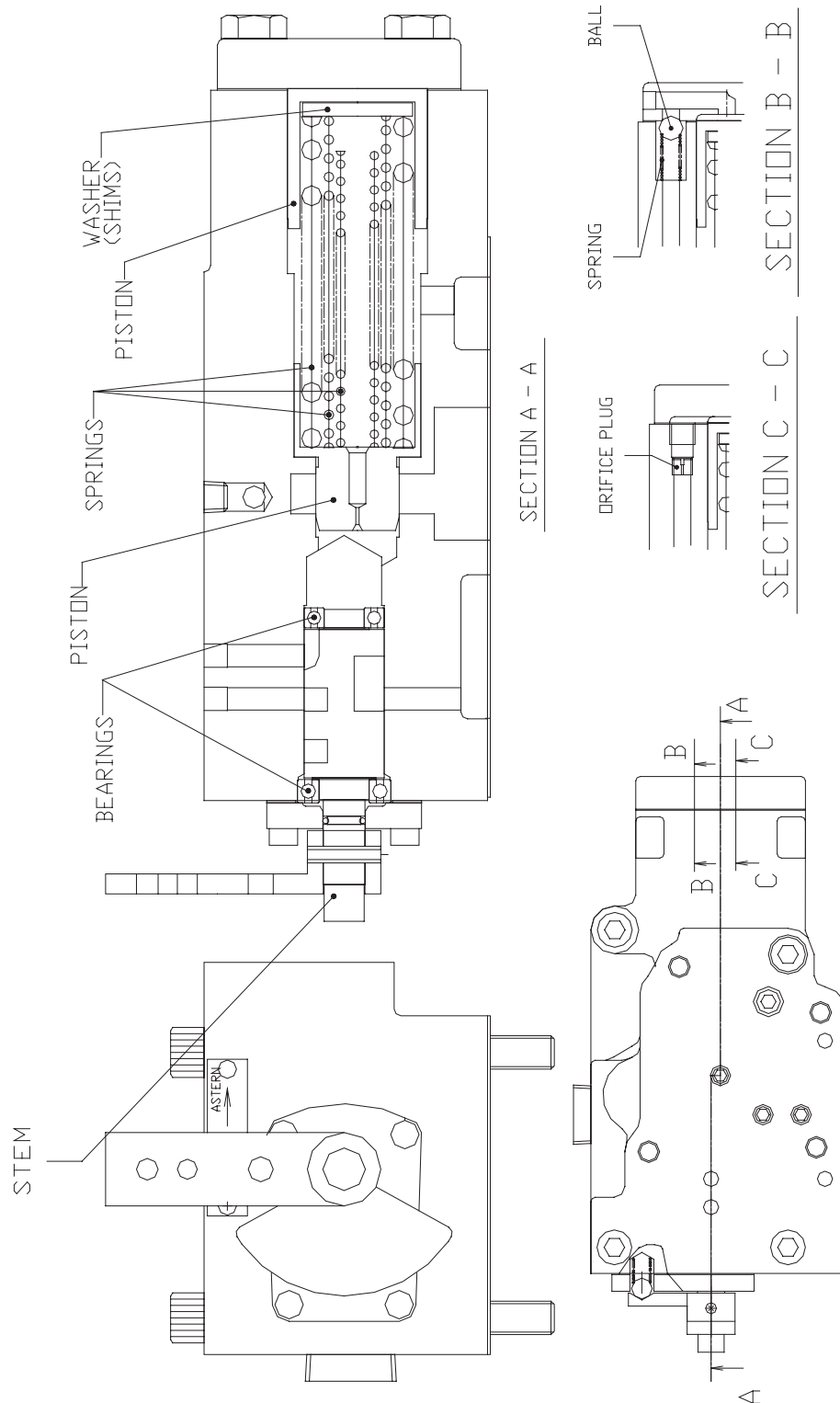


Figure 70. Cross section of mechanical valve assembly

NOTES

Cleaning and Inspection

Cleaning

Note: Replace all oil seals, gaskets, O-rings, piston rings, seal rings and snap rings as a part of any maintenance or overhaul procedure. Replace shims that are damaged or destroyed in disassembly.

- ☐ Clean all parts using EPA/OSHA approved solvents or by steam cleaning. Parts must be dried and oiled immediately to prevent corrosion.
- ☐ Examine all parts carefully for grit, dirt and abrasives and reclean them if necessary.
- ☐ Clean all oil passages by working a piece of wire back and forth through the passages and then flushing them with cleaning solvent.
- ☐ Use clean solvent to flush oil pumps and valves.
- ☐ Flush all hoses, tubing and coolers, particularly if the unit is being disassembled because of an internal failure.
- ☐ De-burr the housing and bearing carrier with a stone or file in the vicinity of all pusher screw locations.

Cleaning Bearings

DO NOT remove grease in which new bearings are packed. Thoroughly wash bearings that have been in service. Soak bearings in solvent if they are particularly dirty or filled with hardened grease.

CAUTION

Never dry bearings with compressed air. DO NOT spin non-lubricated bearings. Oil bearings with SAE 10 engine oil immediately after cleaning. Oil bearings before inspection.

Preventing Dirt from Entering into Bearings

Dirt and grit in bearings are often responsible for bearing failure; consequently, it is important to keep bearings clean. **DO NOT** remove grease from new bearings. Keep the wrapper on new bearings until they are installed. **DO NOT** expose clean bearings if they are not to be assembled at once. Wrap them with a clean lint-free cloth or paper to keep out dust.

Previously Sealed Joints

- ☐ For previously sealed joints, scrape surfaces to remove old gasket material or silicone.
- ☐ Clean surfaces with solvent to remove oil and grease residue.
- ☐ Test for clean surfaces by applying a few drops of cool water to the surfaces. Parts are sufficiently clean if water covers the surface in a film. If the water puddles or forms beads, use fresh solvent and reclean.

Inspection

Housings, Cast Parts, and Machined Surfaces

- ☐ Replace cast parts or housings that are cracked.
- ☐ Inspect bores for wear, grooves, scratches and dirt. Remove burrs and scratches with crocus cloth or soft stone. Replace deeply grooved or scratched parts. **DO NOT** remove excess material by sanding. This will cause loss of press of bearings or races.
- ☐ Inspect oil passages for obstructions. If you find an obstruction, remove it with compressed air or work a wire back and forth through the passage and flush it with solvent.
- ☐ Inspect machined surfaces for burrs, scratches, nicks and foreign matter. If you cannot remove the defect with crocus cloth or a soft stone, replace the part.
- ☐ Inspect ground tapers for burrs or nicks. If you cannot remove the defect with a soft stone, replace the part.
- ☐ Inspect ground tapers for scratches, galling or scoring damage. If you find any of these defects, replace the part.
- ☐ Inspect threaded openings for damaged threads. Chase damaged threads with a tap of the correct size.
- ☐ Inspect studs for damaged threads and looseness. Replace defective studs.
- ☐ Inspect dowel pins for wear or damage. Replace defective dowels. This applies where a matched set of parts is not involved.
- ☐ Inspect dowel pin holes for wear due to movement between mating parts. If a dowel pin hole is worn, re-bore and sleeve the hole when possible. Otherwise, replace the parts. This applies where a matched set of parts is not involved.

Valve Seats

Inspect valve seats for burrs, nicks and scratches. If you cannot remove these defects with a crocus cloth, replace the part. Check to see that the valve is seating properly after reworking the valve seat.

Bearings

- ☐ Inspect bearings for rotation roughness. Replace the bearing if the rotation is rough.
- ☐ Inspect bearings for corrosion, and for wear indication of balls or rollers. Inspect for scored, scratched, cracked, pitted or chipped races. If you find one of these defects, replace the bearing.
- ☐ Inspect bearing bores and shafts for grooved, burred, or galled conditions that would indicate the bearing has been turning in its housing or on its shaft. If you cannot repair the damage with a crocus cloth, replace the part.

Bushings and Sleeves

Inspect bushings for size and out-of-roundness. Inspect for scores, burrs, sharp edges, and evidence of overheating. Remove scores with a crocus cloth. If the bushing is out-of-round, deeply scored, or excessively worn, replace it.

Thrust Washers and Spacers

Inspect thrust washers for distortion, scores, burrs and wear. Rework or replace any defective thrust washers or spacers.

Gears

- ☐ Inspect gears for scuffed, nicked, burred or broken teeth. If you cannot remove the defect with a soft stone, replace the gear.
- ☐ Inspect gear teeth for wear that may have destroyed the original tooth shape. If you find this condition, replace the gear.
- ☐ Inspect thrust faces of gears for scores, scratches and burrs. If you cannot remove these defects with a soft stone, replace the gear.

Splined Parts

Inspect splined parts for stripped, twisted, chipped or burred splines. Remove burrs with a soft stone. Replace the part if other defects are found.

Springs

Inspect springs for broken or distorted coils. Replace the spring if either of these defects is found.

Flexible Hoses

Inspect all flexible hoses for cracks and sponginess. Replace damaged hoses.

Clutch Plates

Inspect clutch plates for signs of overheating, pitting, or excessive wear of the friction and splined surfaces. Replace the clutch plates if one of these defects is found. Refer to wear limits in Description and Specifications.

NOTES:

Assembly

General

During service of this unit, all O-rings, gaskets and seals **must be** replaced.

Refer to cleaning and inspection information in this manual prior to assembly. It is good practice to compare the new parts with those being replaced during the assembly process (to make sure you don't mistake the quantity or size).

Flat washers are used under all fasteners where the head of the fastener contacts an aluminum surface.

Unless otherwise specified, all torque values listed are for capscrews that have been lubricated on the threads and contact surfaces.

Pipe threads called out as PT (British Standard Pipe Taper) on drawings and in this text are different from NPT threads. PT threads and NPT threads are NOT interchangeable. Adapters are available from several manufacturers to convert PT threads to NPT threads.

Where grease is specified, use a lithium based grease (NLGI 2).

Submerge all new clutch friction plates in clean transmission oil for a minimum of one hour prior to installation.

This transmission uses liquid sealer in many locations. The approved sealant is Loctite® 518 (MA1015), applied per S774 (a thin layer of sealant is all that is required), with Loctite® Primer N (MA1012). Avoid getting sealant into the O-ring counter bores.

This transmission uses thread lockers MA908 and MA1007 at specified capscrew locations.

Note: In the discussion that follows, the input side of the transmission is the front and the output side is the rear. Left and right sides are determined by facing from the rear toward the front.

CAUTION

Appropriate eye protection must be worn during transmission assembly. To avoid personal injury, proper safety equipment must be used during installation of any heated bushings, bearings and other components.

Primary and Secondary Clutch Assembly

⚠ WARNING

Handle the bearing with care. The bearing is HOT.

Primary and Secondary Shaft

1. Heat the tapered roller bearing (1) to 120 degrees C (248 degrees F). Install the bearing to both primary and secondary shafts.
2. Rotate the shafts upside down. Heat the needle bearing inner race (2) to 120 degrees C (248 degrees F) and install onto shafts.



CL001-5506



CL002 -5506

Figure 71. Tapered Bearing Installation

3. Install the snap ring (3) onto the shaft.



CL003-5506

Figure 72. Snap Ring Installation

4. Install both large (4) and small (5) square-rings into the grooves of the clutch piston. Apply grease (6) to both square rings.



CL005-5506



CL006-5506

Figure 73. Square Ring Installation

5. Thread two eyebolts into the clutch piston to use as handles and install the clutch piston (7) into the clutch housing (8). Remove the eye bolts installed as handles.



CL007-5506



CL008-5506

Figure 74. Clutch Piston Installation

6. Install anti-rotation pin (9) into the clutch housing.
7. Install a steel plate (10) next to the clutch piston.



CL009-5506



CL010-5506

Figure 75. Plate Installation

8. Install a friction plate (11). Install the remaining steel and friction clutch plates in an alternating fashion. (Total: 7 steel plates and 6 friction plates).
9. Install the backing plate (12).



CL011-5506



CL012-5506

Figure 76. Backing Plate Installation

10. Install the snap ring (13) to secure the clutch plates in the housing.
11. Install the seal rings (14) on the shaft.



CL013-5506



CL014-5506

Figure 77. Snap and Seal Ring Installation

12. Install the wave spring pack (15) into the clutch housing.
13. Install the wave spring pack retainer (16), aligning the slot over the anti-rotation pin.



CL015-5506



CI016-5506

Figure 78. Wave Spring and Retainer Installation

14. Install the taper roller bearing (17) into clutch housing.
15. Install the taper roller bearing (18) outer race into the pinion gear assembly with the larger diameter end facing out.



CL017-5506



CL018-5506

Figure 79. Roller Bearing Installation

16. Rotate the pinion upside down. Install the needle bearing outer race (19) into the pinion.
17. Install the oil dam (20) on top of the outer race.



CL019-5506



CL020-5506

Figure 80. Pinion Bearing Installation

18. Install a snap ring (21) to secure the oil dam and needle bearing assembly.
19. Heat the taper roller bearing (22) to 120 degrees C (248 degrees F) and install the bearing onto the pinion.

⚠ WARNING

Handle the bearing with care. The bearing is HOT.



CL021-5506



CL022-5506

Figure 81. Snap Ring and Tapered Bearing Installation

20. Gently rotate the pinion as the pinion (23) is lowered into the clutch plates (24) until the splines are fully engaged in all of the clutch plates.



CL023-5506



CL024-5506

Figure 82. Rotate Pinion and Engage Splines

21. Install the special tool (25) (pinion retainer) and set aside for later assembly into the housing.



CL025-5506

Figure 83. Pinion Retainer Installation

Output Shaft Assembly

1. Heat the output shaft bearing inner race (1) to 120 degrees C (248 degrees F). Install the race onto the output shaft.

⚠ WARNING

Handle the bearing with care. The bearing is HOT.

2. Install the snap ring (2) over the output shaft and ensure the snap ring is securely seated in the proper groove (3).



AS001-5506



AS002-5506

Figure 84. Bearing Race and Snap Ring Installation



AS003-5506

Figure 85. Snap Ring Seated in Groove

3. Wrap the output shaft with vinyl tape to prevent scratching the oil seal contact surface.
 - Rotate the output shaft upside down.
 - Measure the distance from the end of the shaft to the shoulder where the shaft taper begins.
 - Record this distance as dimension A.
4. Install the output gear (5) onto the output shaft without applying force.



AS004-5506



AS005-5506

Figure 86. Output Gear Installation

Note: Transmission assemblies 739380, 739582, and 739588 have a shallow taper, and require a shim between the shoulder of the shaft and the trailing pump drive gear. Transmission assembly 00D005604 has a steep taper, and does not require a shim in that location.

5. Measure the distance from the end of the output shaft to the gear end (6).
 - Record this distance as dimension B.
 - The expected clearance, A - B will allow a gear advance of between 8.14 to 9.86 mm (0.32 to 0.38 inches) (assemblies 739380, 739582, and 739588). Assembly 00D005604 will have an advance of 2.4 to 3.0 mm (0.094 to 0.118 inches).
 - Greater clearance will be shimmed as determined to properly control the advance. (See note above.)
6. Remove the gear (7) from the output shaft.



AS006-5506

Figure 87. Output Gear Installation

7. Measure the distance from the end of the output shaft to the shoulder where the gear will stop. Record this distance as dimension C.
8. Put the output gear (9) on a machined surface. Measure the thickness and record the thickness as dimension D.



AS007-5506



AS008-5506

Figure 88. Output Shaft and Gear Installation

9. Put the pump drive gear (10) on a machined surface. Measure the thickness and record the thickness as dimension E.
10. Using the dimensions obtained in steps 5 through 9, determine the shim pack thickness necessary to obtain the proper gear advance of 8.14 to 9.86 mm (0.32 to 0.38 inches) (Transmission assemblies 739380, 739582, and 739588), by following the formula:

Shim Pack Thickness = (C - A) - (D + E) - (Desired advance of 8.14 to 9.86 mm) where (C - A) is the distance between the two shoulders and (D + E) is the thickness of the two gears. Assembly 00D005604 will have an advance of 2.4 to 3.0 mm (0.094 to 0.118 inches).



AS009-5506



AS011-5506

Figure 89. Pump Drive Gear Measurement

Trailing Pump Shaft Assembly

1. Install the pump shaft and gear assembly (1) into the housing. Pull up the pump shaft until the gear contacts the housing inside.
2. Retain the shaft assembly by blocking with spacers or a proper jack (2).



AS012-5506



AS013-5506

Figure 90. Pump Shaft Assembly Installation

3. Install a ball bearing (3) followed by a spacer (4).



AS014-5506



AS015-5506

Figure 91. Pump Shaft Assembly Installation

4. Install another ball bearing (5), followed by the external snap ring (6).



AS016-5506



AS018-5506

Figure 92. Ball Bearing Installation

5. Be sure that the snap ring is seated securely, and remove the jack from beneath the pump shaft.

Output Gear Installation

1. Install the rear output shaft bearing (1) and clamp it (2) temporarily in position in the transmission housing.



AS019-5506



AS020-5506

Figure 93. Output Shaft Bearing Installation

2. Rotate the housing upside down. Place two angle iron pieces (3) in the housing for the gear to slide on.
3. Lift the gear (4) with the two M24 x 2.0 eyebolts (5) and a suitable hoist. Install the gear halfway into the housing, being sure that the gear is supported by the angle iron pieces.
4. Remove eyebolts (5) and carefully push the gear (4) to the center of the housing.



AS021-5506



AS022-5506

Figure 94. Output Gear Installation

5. Install the previously selected shim pack (6) onto the output shaft. (Transmission assemblies 739380, 739582, and 739588).
6. Install the pump drive gear positioning roll pins (7) onto the output gear.



AS024-5506



AO040-5506

Figure 95. Shim Pack and Roll Pin Installation

7. Install the pump drive gear (8) onto the output gear.
8. Use a driver to push the pump gear (8) until it contacts the output gear.



AO043-5506



AO044-5506

Figure 96. Pump Drive Gear Installation

⚠ CAUTION

The tapered surface of the shaft and matching tapered gear bore must be completely free of grease, oil dirt, and solvent residue. Failure to properly clean mating parts could prevent proper advance of the gear on the shaft and adversely effect torque carrying capacity of the assembled joint.

9. Clean the shaft tapered surface and the gear bore with an approved solvent. Dry the shaft and clear all oil passages in the shaft with compressed air.

⚠ CAUTION

Damage to the output shaft could result if appropriate care is not taken during the installation process.

10. Stand the output shaft (9) upright. Lift the housing and gear with a hoist. Lower the housing over the output shaft making sure that the shaft tapered diameter enters the gear bore.
11. Adjust the level of the housing with jacks (10). Remove the angle iron pieces.



AS025-5506



AS026-5506

Figure 97. Housing Installation

12. Install the hydraulic ram (11). Connect the hydraulic ram to the output shaft with socket head capscrews. Tighten the capscrews to a torque of 500 N•m (360 lb-ft).



AS027-5506



AS028-5506

Figure 98. Hydraulic Ram Installation

AS029-5506

Figure 99. Output Gear Installation

13. Connect a hydraulic power supply (12) to the hydraulic ram.
14. Seat the output gear on the output shaft taper with 50,000 kPa (7250 PSI). Hold the pressure on the assembly for a minimum of 5 minutes.
15. Remove the hydraulic ram assembly.

Thrust Bearing Installation

1. Install the bearing spacer (1) over the end of the shaft against the gear.



AS030-5506

Figure 100. Bearing Spacer Installation

⚠ WARNING

Handle the inner races with care. The races are hot.

2. Install the tapered roller bearing outer race into the housing.
3. Heat the associated inner race (2) to 120 degrees C (248 degrees F) and install it onto the output shaft against the spacer.



AS031-5506



AS032-5506

Figure 101. Roller Bearing Outer and Inner Race Installation

4. Heat the thrust bearing inner race (3) to 120 degrees C (248 degrees F) and install it onto the output shaft against the tapered roller bearing inner race.
5. Install the thrust bearing outer race (4) onto the thrust bearing rollers.



AS033-5506

Figure 102. Bearing Outer Race Installation

6. Install the washer at the end of the output shaft. Temporarily snug the bolts (5). These will be torqued where the unit is turned so the shaft can be restrained.



AS034-5506

Figure 103. Washer Installation

7. Install three clamps and adjust the clamp screws (6) to set the thrust bearing outer race level an equal distance from the rear housing surface.
8. Measure the depth from the housing end to the thrust bearing outer race. Record this depth as dimension A (7).
9. Measure the distance from the end of the cover to the shoulder. Record this distance as B (8).
10. Determine the proper thickness of the shim pack by the following calculation. Select a shim pack thickness so that the clearance A - B will be between 0 to 0.05 mm (0 to 0.002 in).



AS035-5506



AS036-5506

Figure104. Shim Pack Thickness Calculation

Note: The calculated shim thickness will include two spacers and shims in assembly 739380 and 739582, one spacer and shims in assembly 739688, and shims only in assembly 00D005604.

11. Rotate the housing, positioning it on the bottom housing surface on blocking so that the output gear is clear of the floor.
12. Lock the output shaft (9) using a suitable restraint.
13. Tighten the bolts (10) to 1581 N•m (1166 lb-ft).



AS037-5506



AS038-5506

Figure 105. Lock Output Shaft and Tighten Bolt (3)

14. Rotate the housing with the output end down, blocking so that the output shaft clears the floor.

Shim Pack and Cover Installation

1. Apply grease to the O-ring (1) on the cover. Fill the spring pockets with grease.
2. Install the coil springs into the grease-filled pockets (2) of the cover.



AS039-5506



AS040-5506

Figure 106. Grease O-ring and Install Coil Springs

3. For assembly 739380 and 739582, Install the selected shim pack (including spacers) into the housing against the thrust bearing surface with the two holes aligned. For assembly 739688, install a spacer against the thrust bearing surface. For assembly 739688 and 00D005604, install the selected shim pack over the cover pilot, aligning the capscrew holes.



AS041-5506

Figure107. Shim Pack Installation

4. Put two guide pins (4) into the holes of the shims (assemblies 739380, 739582, and 739688). Assembly 00D005604 does not have guide pins or guide pin holes.
5. Install the cover (5) over the guide pins. Be sure that the machined slot in the cover pilot is toward the top of the unit, aligned with the oil passage. Be careful the coil springs do not come out of the pockets.



AS042-5506



AS043-5506

Figure 108. Install Guide Pins and Cover

6. Be sure that the guide pins remain free to move and tighten the cover (5) capscrews to 348-400 N•m (257-295 lb-ft).



AS044-5506

Figure 109. Tighten Bolts

7. Remove a guide pin, and install a roll pin (6) into the output shaft cover so that it extends into the hole in the shim pack. Repeat this for the second guide pin and roll pin.
8. Install taper thread plug (7) into the threaded holes in the cover.

Note: Steps 7 and 8 do not apply to assembly 00D005604.



AS045-5506



AS046-5506

Figure 110. Roll Pin and Taper Thread Plug Installation

9. Rotate the unit with the output side up.

Output Seal Carrier Installation

1. Push down the trailing pump drive shaft assembly (1) until it meshes with the pump drive gear (2).
2. Install the internal snap ring (3) to secure the pump shaft in the housing.



AS048-5506



AS050-5506

Figure 111. Pump Drive Shaft Assembly and Snap Ring Installation

3. Install the oil seal so that it is flush with the inner surface of the seal carrier. Apply grease to the oil seal lip (4).
4. Apply MA 1015 sealant to the seal carrier where it contacts the housing.
5. Install the seal carrier (5) onto the housing. The TOP mark on the seal carrier should be toward the top of the transmission.



AS051-5506



AS052-5506

Figure 90. MA1015 Sealant and Seal Carrier Installation

6. Tighten the bolts (6) securing the seal carrier, and torque to 96 N•m (70.8 ft-lb).



AS053-5506

Figure 112. Tighten Bolts

Speed Sensor Gear Installation

1. Heat the speed sensor gear to 120 degrees C (248 degrees F).
2. Install speed sensor gear (1) onto the pilot diameter of the output flange. Allow the gear to cool.



AS054-5506

Figure 112. Speed Sensor Gear Installation

3. Place the output flange (2) onto output shaft (3) without forcing down.
4. Measure the distance from the end of the flange to the end of the output shaft.
 - Record this distance as A.
 - Measure the pocket depth (from the same end of flange to the small diameter taper end).
 - Record this depth as B.
 - The calculated expected advance = $A - B$, and must be between 8.74 to 10.20 mm (0.34 to 0.40 inches).



AS055-5506



AS056-5506

Figure 114. Mount Output Flange and Calculate Expected Advance

5. Install the special tool (4) (hydraulic ram) onto the output flange. Tighten the capscrews to a torque of 500 N•m (360 lb-ft).



AS057-5506

AS058-5506

Figure 115. Special Tool (Hydraulic Ram) Installation

6. Connect a hydraulic power supply to (5) the hydraulic ram.



AS058-5506

Figure 116. Hydraulic Power Supply Installation

7. Seat the output gear on the output shaft taper with 50,000 kPa (7250 PSI). Hold the pressure on the assembly for a minimum of five minutes.
8. Remove the hydraulic ram and install two taper threaded plugs (5) into the end of the output shaft.
9. Install the washer and tighten the screws (6). Torque the screws to 1581 N•m (1166 lb-ft).



AS059-5506



AS060-5506

Figure 117. Plug Installation and Tighten Bolts

10. Install the trailing pump gasket and cover (7) onto the transmission housing. If the transmission is equipped with a trailing pump, install it at this time.



AS061-5506

Figure 118. Cover Installation

11. Install O-ring (8) into the groove of the trailing pump suction port cover (7).
12. Apply grease to the O-ring.
13. Install the trailing pump suction port cover (7) to the housing.



AS063-5506

Figure 119. O-ring Installation

Bottom Cover Installation

1. Apply MA1015 sealant (1) onto the bottom cover where it contacts housing.



AS064-5506

Figure 120. MA1015 Sealant Installation

2. Rotate the transmission assembly with the bottom down, and use guides to align the bottom cover with the housing. Assemble bottom cover (2) and housing (3) and torque the capscrews (4) to 96 N•m (71 lb-ft).



AS065-5506

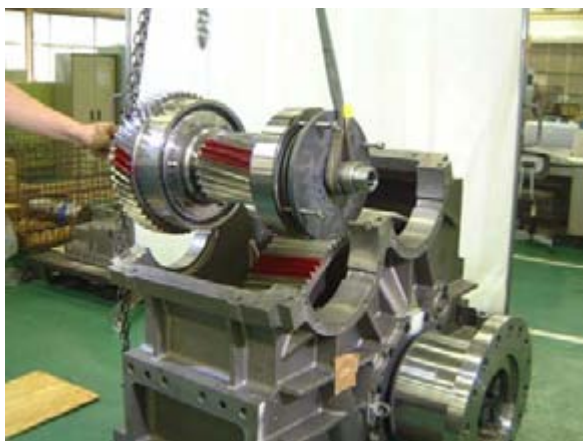


AS066-5506

Figure 121. Bottom Cover and Housing Assembly

Shaft Assembly Installation

1. Install the previously assembled secondary shaft assembly (1).
2. Install the previously assembled primary shaft assembly (2).



AS067-5506



AS068-5506

Figure 122. Secondary and Primary Shaft Assembly Installation

3. Remove the special pinion retainers from the clutch shafts. Install clamps to retain the pinons and bearings in place.
4. Apply MA1015 sealant onto the housing (3) and top cover contact.



AS070-5506

Figure 123. MA1015 Sealant Installation

5. Place the top housing half (4) on the lower housing (5).



AS071-5506

Figure 124. Top Cover and Housing Assembly

6. Install the tapered dowel pins (6) to align the transmission housing.
7. Install and tighten M12 x 1.75 bolts (7) to 74–86 N•m (55–63 lb-ft).



AS072-5506



AS073-5506

Figure 125. Dowel Pin Installation and Tighten Bolts

8. Apply MA1015 sealant onto the secondary shaft front cover where it contacts housing.
9. Install the secondary shaft front cover (8) and torque the capscrews to 96 N•m (71 lb-ft).



AS074-5506

Figure 126. Cover Installation

10. Apply MA1015 sealant to the outside diameter of the oil seal. Press the oil seal into the seal carrier until it is flush with the outer face.
11. Apply grease to the input oil seal lip.
12. Apply MA1015 sealant onto the seal carrier where it contacts housing.

13. Install the seal carrier (9).
14. Tighten the M12 capscrews to 96 N•m (71 lb-ft).



AS075-5506

Figure 127. Seal Carrier Installation

Shim Pack Installation

1. Install additional clamps (1) (four total per shaft) and tighten the screws evenly (2) until they contact the bearing outer race on the secondary shaft assembly.
2. Measure the depth from the housing to the bearing outer race.
 - Record this depth as A.
 - Measure the distance from the end of pump base to the first shoulder. Record this distance as B.
 - Determine proper thickness of shim pack by following calculation. The calculated expected clearance = $A - B$, must be between 0 to 0.10 mm (0 to 0.004 inches).



AS076-5506



AS077-5506

Figure 128. Calculate Shim Pack Thickness

3. Repeat steps 1 and 2 for the primary cover (2) shim pack installation.
4. Remove the temporary clamps.



AS078-5506

Figure 129. Calculate Shim Pack Thickness

5. Grease and install five O-rings (3).



AS080-5506

Figure 130. O-ring Installation

6. Install the shim packs (4). Apply grease to hold the shim packs together and in place.



AS081-5506



AS082-5506

Figure 131. Shim Pack Installation

Pump Assembly Installation

1. Apply MA1015 sealant to the pump base (1) where it contacts the housing.
2. Be sure the seal rings are in place, and install the pump base (1) on the secondary shaft.



AS083-5506



AS084-5506

Figure 132. MA1015 Sealant and Pump Base Installation

3. Apply MA1015 sealant to the primary shaft rear cover (2) where it contacts housing.
4. Be sure the seal rings are in place, and install the primary shaft rear cover (2) and torque the capscrews to 76–86 N•m (55–63 lb-ft).



AS085-5506

Figure 133. Supply Cover Installation

5. Install gasket and pump assembly (3) onto the pump cover.



AS086-5506

Figure 134. Pump Assembly Installation

6. Grease the O-rings and install the strainer housing and suction tube (4) into the transmission housing and secure with nuts and lockwashers to the pump assembly. Torque the nuts to 75 N•m (55 lb-ft).



AS087-5506

Figure 135. Strainer Case Installation

6. Grease and install an O-ring onto the heat exchanger pipes.
7. Install the pipes with the flange (5) onto the transmission.



AS088-5506



AS089-5506

Figure 136. Pipe with Flange Installation

Heat Exchanger Installation

Heat exchangers furnished by Twin Disc to be used in salt water applications have zinc anode rods installed at the heat exchanger inlet and outlet heads. These rods must be checked every 90 days. If over 50% of the rod is disintegrated, it should be replaced to provide effective protection.

Excessive corrosion of the zinc anode rod indicates electrolytic action. A careful inspection should be made to determine if this action is caused by a short circuit or externally grounded electrical current. If these conditions do not exist, it is evident the corrosion is due to local electrolysis.

If the zinc anode rods are corroded with foreign materials, they should be cleaned with a wire brush.

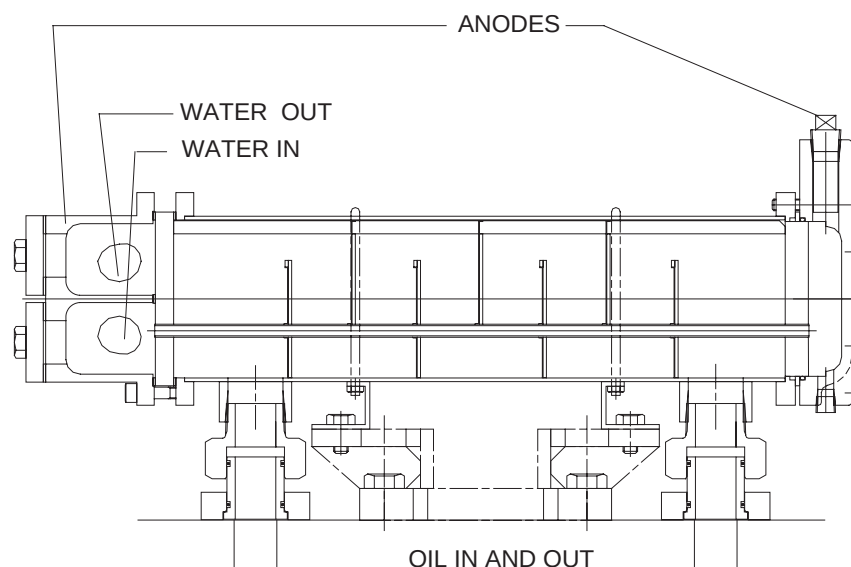


Figure 137. Heat Exchanger Component Identification and Location

1. Install heat exchanger mounting bracket (1) and torque the M16 x 45 screws to 236 N•m (174 lb-ft).



AS090-5506



AS091-5506

Figure 138. Heat Exchanger Bracket Installation

2. Install the U-bolt mounting base to the bracket and torque four M10 x 20 capscrews to 55 N•m (41 lb-ft).
3. Install heat exchanger with U-bolts (2) and torque the retaining nuts to 12.5 N•m (9 lb-ft).



AS092-5506

Figure 139. Heat Exchanger Installation

3. Install the inspection cover (4) and torque the M10 capscrews to 55 N•m (41 lb-ft).



AS093-5506

Figure 140. Inspection Cover Installation

Oil Filter Installation

1. Install the oil filter bracket (1) and torque the M12 x 25 capscrews with washers to 96 N•m (70 lb-ft).
2. Grease and install O-ring to the oil filter tube.
3. Install the oil filter tube into the housing, and attach the filter housing to the bracket (2) and torque the M10 x 20 capscrews to 55 N•m (41 lb-ft).



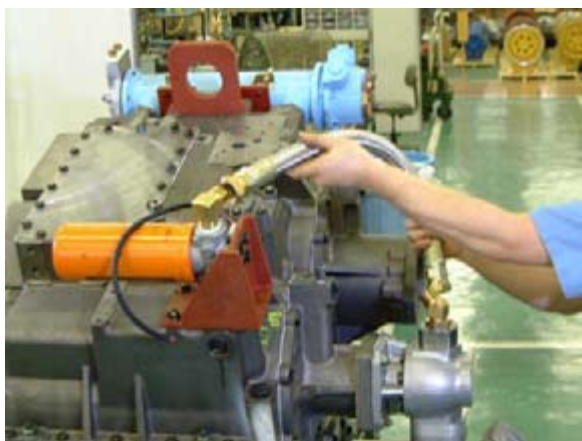
AS094-5506



AS096-5506

Figure 141. Oil Filter Bracket and Oil Filter Installation

4. Install the braided (3) oil hose between the oil filter inlet and pump outlet and drain hose (4) to the sump.



AS097-5506



AS098-5506

Figure 142. Hose Installation

5. Install the flat cover (4) and gasket to the primary shaft rear cover. Torque the 1/2-13UNC x 28 mm socket head capscrews to 120 N•m (88 lb-ft).



AS099-5506

Figure 143. Cover Installation

Assembly of GP Control Valve with Electronic Interface

Prior to assembly, all parts must be properly cleaned. Carefully inspect all o-rings for any damage, and replace as necessary. Lubricate all o-rings, and replace both gaskets.

1. Assemble the Main Regulator Valve body.
 - A. Install the filter into the threaded hole of the valve body, and torque to 7.5 Nm (5.5 Ft-lb). If removed, install a new check valve assembly into the bore of the valve body, and drive it with a drift until it is flush with the face of the body. Install the 3/8 nptf pipe plug or optional temperature sensor into the valve body and torque to 23 Nm (17 Ft-lb).
 - B. Install the gasket and cover without the adjustment screw to the valve body with four M8 x 25 capscrews and torque to 23 Nm (17 Ft-lb).
 - C. Install the spool with washer, and spring into the bore. Install the gasket, and cover with the adjustment screw, using four M8 x 25 capscrews. Evenly tighten the capscrews, and torque to 23 Nm (17 Ft-lb).
 - D. Install the cap onto the adjusting screw finger tight as the main pressure must be set at the time of installation or testing.

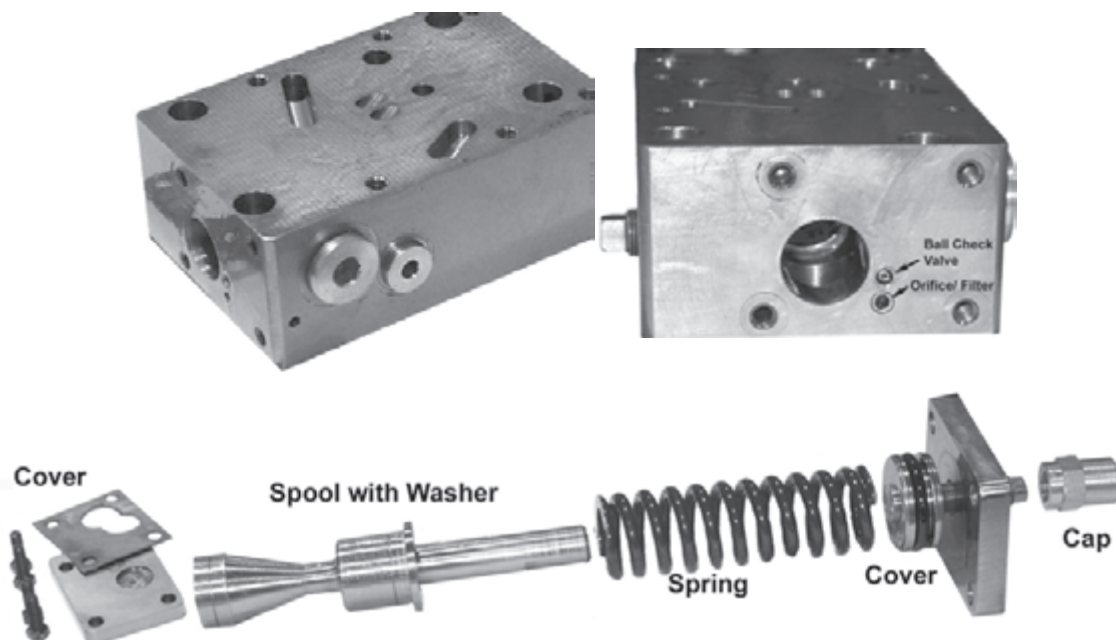


Figure 144. Assemble Main Pressure Regulator Components

2. Assemble the Top Valve Body. Install the two proportional valve assemblies into the valve body, install the retaining plate, and torque the M6-1.00 x 16 socket head capscrew to 9.5 Nm (7 Ft-lb). Install the Manual Direction Control Valve into the valve body, and torque to 27 Nm (20 Ft-lb). Install the M12x1.50 o-ring plug into the valve body and torque to 16 Nm (12 Ft-lb). Connect the wires for the Neutral Switch.

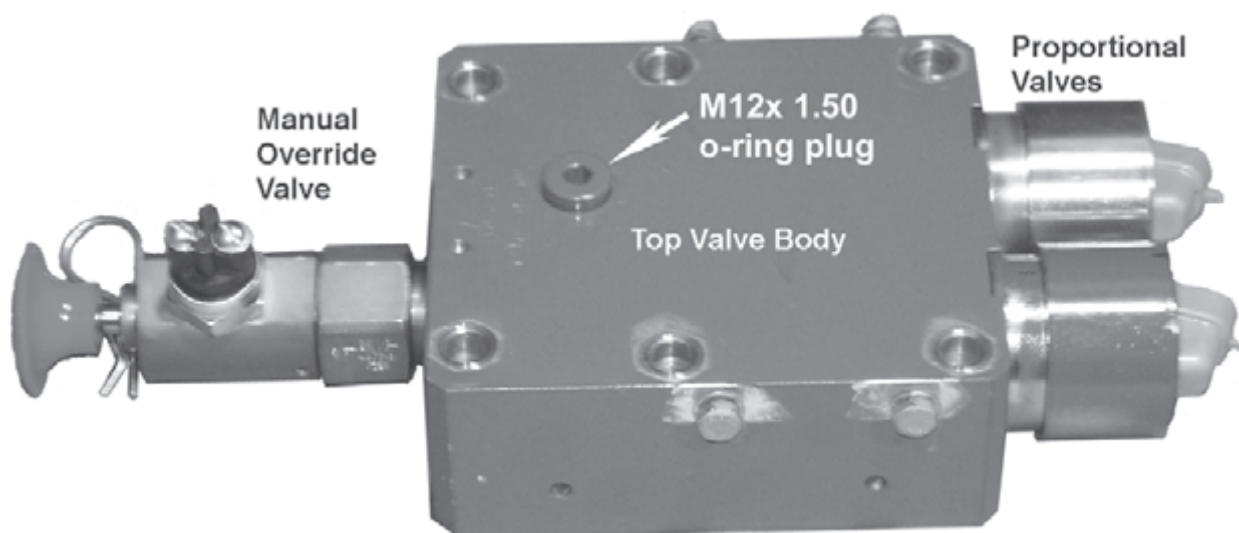


Figure 145. Assemble Top Valve Body Components

3. Install a new gasket, and the Main Regulator Valve Assembly to the transmission or ditch plate, using the four twelve point capscrews. Torque the capscrews to the level specified for the appropriate sized capscrew into aluminum threads. See the torque specifications in [Description and Specifications](#).

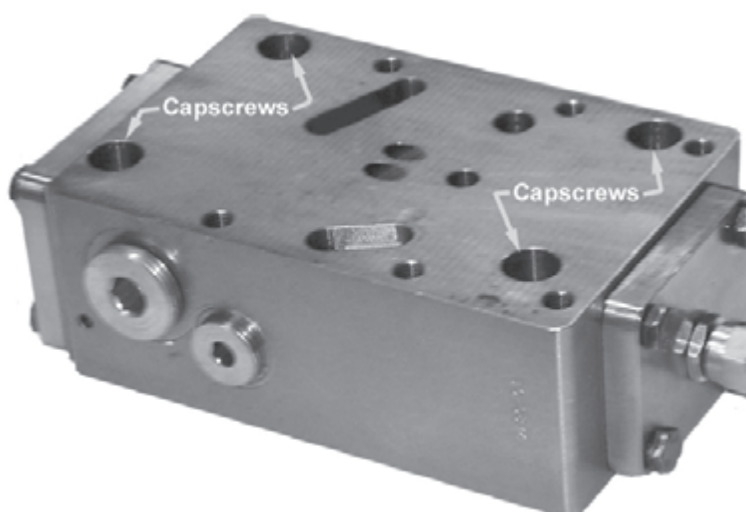


Figure 146. Install Regulator Valve Body to Transmission

4. Install a new gasket, and the Top Valve Body Assembly on the Main Regulator Valve Assembly, using six M10-1.50 x 70 hex head capscrews, and torque to 46 Nm (34 Ft-lb).

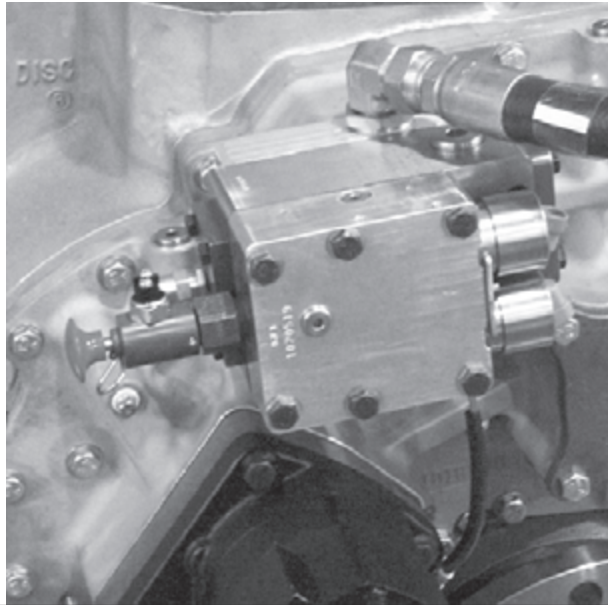


Figure 147. Install Top Valve Body onto Regulator Valve Assembly

5. Install the Electronic Profile or E-Troll Module on the top Valve Body, and torque the four M6-1.0 capscrews to 9.5 Nm (7 Ft-lb).



Figure 148. Place Profile or E-Troll Module onto Valve and tighten screws

6. Connect the electrical wires to the proportional valves, and connect any other wires that were removed during disassembly.

Assembly of 1018084 Electric Control Valve

Assembly of Electrical Control Valve (upper body half)

1. Install one dowel pin (large diameter) into each of the two bores of the valve body.
2. Install one spring into each of the two bores of the valve body.

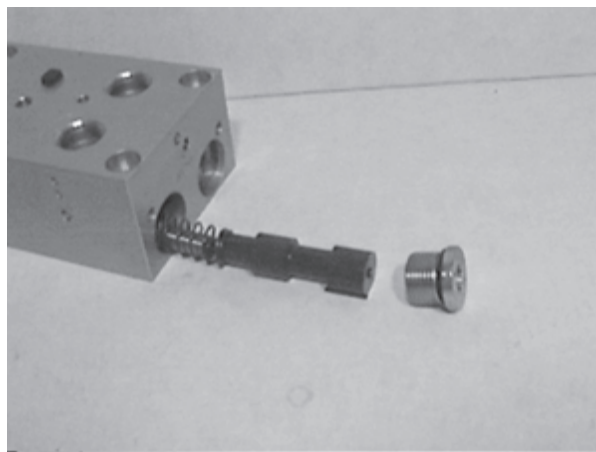


Figure 149. Dowel, Return Spring, Spool, and Plug

3. Install one spool into each of the two bores of the valve body.
4. On units equipped with the hydraulic lock feature, install one spring followed by one pin (small diameter) into each of the spools.
5. Install the two O-ring plugs into the valve body and tighten to 75 Nm (55 lb.-ft.)
6. Apply lubricant (such as Dow Corning 200[®] 30,000cSt fluid) to the O-rings of the solenoids and plug (plug used on units without hydraulic lock). Install solenoids (and plug, if equipped) into the valve body and torque them to 34 Nm (25 lb.-ft.).
7. Insert the wires (pins) into the Weatherpak connector according to the location markings made at disassembly. Close the end of the Weatherpak connector to lock the wires in position.
8. Install the Weatherpak connector onto its retaining clip on the top of the valve body.

Assembly of Electrical Control Valve (lower body half)

1. Install the steel shuttle ball into its bore in the valve body.
2. Install the O-ring onto the shuttle ball seat.
3. Apply lubricant such as Dow Corning 200® 30,000cSt fluid to the O-ring, and install the seat into the valve body. Be sure to align the roll pin holes in the seat with the holes in the valve body. One of the valve's M8 x 1.25 cover screws threaded into the seat can be used to adjust the seat location in the valve body.
4. Install the roll pin to retain the shuttle ball seat. Drive the roll pin in until it is flush with the gasket surface of the valve body.

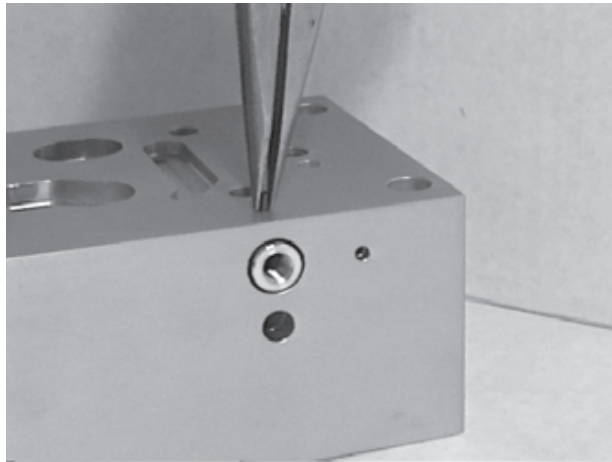


Figure 150. Installing Shuttle Ball Seat Roll Pin

5. Install the stem into the valve body, aligning the slot in the stem with the threaded hole in the valve body for the dog-point setscrew. Be sure the slot in the stem is aligned with the setscrew hole in the valve body to prevent damage to the stem and valve body.

6. Apply MA908 threadlocker to the threads of the dog-point setscrew and install. Tighten the dog-point setscrew until snug, then back off 1/2 turn.

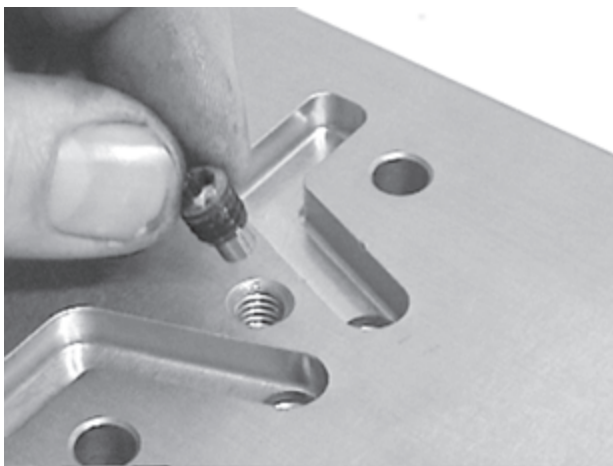


Figure 151. Installing Dogpoint Setscrew

7. Install the steel detent ball into the valve body.
8. Install the detent spring over the detent ball.
9. Apply MA908 threadlocker to the threads of the hollow setscrew and install into the threaded hole. A stepped Allen wrench, or one wrapped with tape will ease the installation of the hollow setscrew. Tighten the setscrew until it is flush with the gasket surface of the valve body. Check the stem rotation and detent action.



Figure 152. Installing Detent Ball Setscrew

10. Install the thrust bearing and races (thrust washer on earlier units) over the end of the stem.
11. Press the oil seal into the cover assembly until flush with the adjacent cover surface.
12. Install the O-ring into the counterbore in the cover assembly.
13. Apply grease to the stem, O-ring, and oil seal lip.
14. Install cover assembly and gasket onto valve body. Be sure to align the oil drain hole in the gasket with the hole in the valve body.

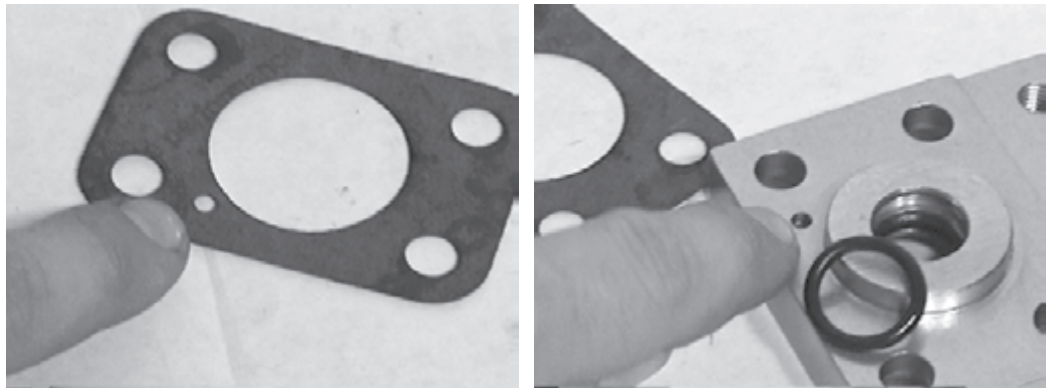


Figure 153. Holes in Gasket and Cover Must be Aligned

15. Install cover capscrews and torque to 23 Nm (17 lb-ft).
16. Install washer over stem and against oil seal.
17. Install spring over stem against washer.
18. Install lever onto the stem. It may be necessary to splay the lever to be able to install it. DO NOT apply any impact force to the lever, as the stem or dog-point setscrew may be damaged. Torque the lever's attaching screw to 9.5 Nm (7 lb.-ft.).
19. Install external retaining ring onto stem .
20. Install the steel balls and electrical switches into the bores in the sides of the valve body (if equipped). Note that the small diameter ball is inboard of the large diameter ball at each switch location.

21. Install the pressure regulating piston into valve body with spring pocket out.
22. Install pressure regulating springs into valve body and into piston spring pocket.
23. Install the shims that were removed into the bore of the rate-of-rise piston. Install the rate-of-rise piston over the springs and into valve body.
24. Install neutral pressure regulating spring into the pocket of valve body.

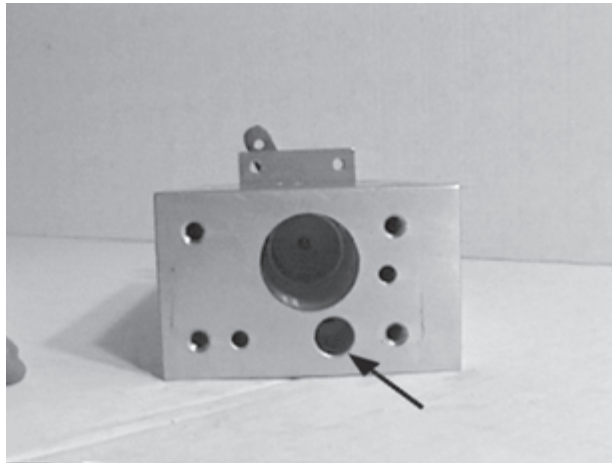


Figure 154. Neutral Pressure Regulating Spring Location

25. Install the orifice protection screen into the valve body.



Figure 155. Installing Screen

26. Install orifice plate gasket onto valve body.
27. Install orifice plate and steel ball (against spring) onto valve body.
28. Install orifice plate cover and gasket onto valve body. Install cover capscrews and torque to 23 Nm (17 lb.-ft.).
29. Install gasket over lower valve body half.
30. Set upper valve body half over lower valve body half. Insert the valve attaching screws through valve body halves to keep parts in alignment until installation onto the transmission. When installing the valve onto the transmission, torque the screws to 54 Nm (40 lb.-ft.).
31. Install control valve ditch plate and gasket. Torque the ditch plate attaching capscrews to 52 Nm (38 lb.-ft.).
32. Install control valve and gasket. Torque the valve attaching capscrews to 54 Nm (40 lb.-ft.).

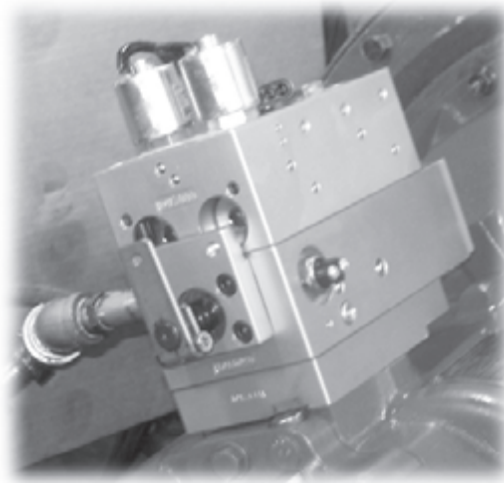


Figure 156. Installing O-ring onto Adapter

Assembly of Mechanical Control Valve

Use the cross section drawing as a guide to assembling the mechanical valve.

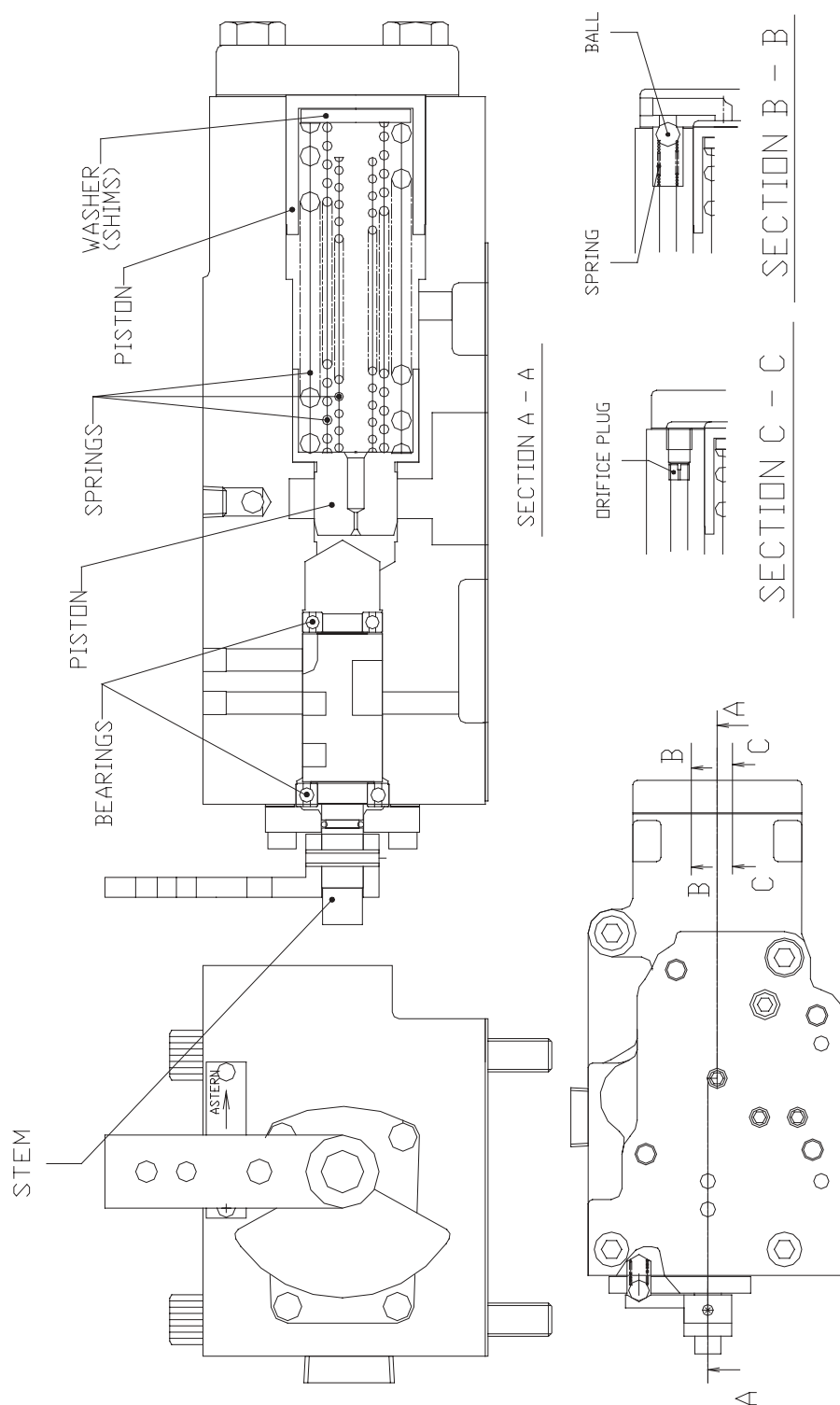


Figure 157. Mechanical Valve Cross Section

Control Valve Installation (GP Control Valve)

1. Install the control valve (1) with gasket (2) using four M10 x 65 capscrews. Torque to 54 N•m (40 lb-ft). Align the gasket with all holes and passages.



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Figure 158. Control Valve and Gasket Installation

2. Install the upper half of the valve with O-rings and torque the six M10 x 70 capscrews to 54 N•m (40 lb-ft).

Control Valve Installation (Mechanical Valve)

Install the control valve with gasket using three M10 x 100 and one M10 x 85 capscrews. Torque to 54 N•m (40 lb-ft). Align the gasket with all holes and passages.

Control Valve Installation (Electric Valve)

Install the control valve with gasket using four M10 x 145 capscrews. Torque to 54 N•m (40 lb-ft). Align the gasket with all holes and passages.

Input Flange Installation

1. Mount the input flange (1) onto the input shaft without force.
2. Measure the distance from the input flange to the end of input shaft. This distance must be between 3.94 to 5.06 mm (0.15 to 0.19 inches).



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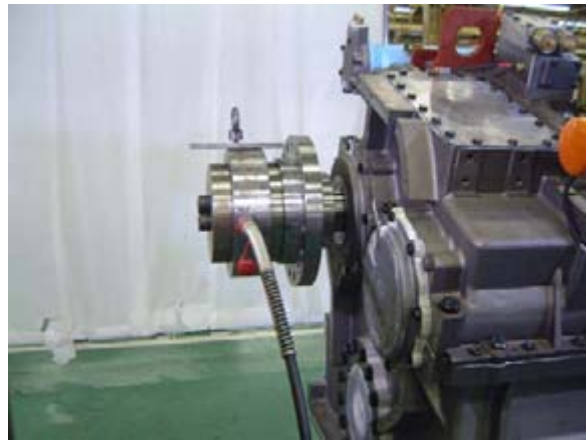
Figure 159. Input Flange Installation and Measurement

3. Install the special tool (2) (hydraulic ram) onto the input flange. Tighten the capscrews to a torque of 500 N•m (360 lb-ft).

4. Connect a hydraulic power supply (3) to the hydraulic ram.



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Figure 160. Special Tool (Hydraulic Ram) Installation

5. Seat the input flange onto the shaft taper with 50,000 kPa (7250 PSI). Hold the pressure on the assembly for a minimum of 5 minutes.
6. Remove the hydraulic ram.

Front Housing Installation

1. Install the front housing (1) and insert two locating dowel pins. Install twelve M12 x 35 and four M12 x 60 capscrews and torque to 96 N•m (71 lb-ft).



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Figure 161. Front Housing Installation

2. Install the pilot ring (2). Torque the three M10 x 25 socket head capscrews to 55 N•m (41 lb-ft).



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Figure 162. Collar Installation

3. Install and align the adapter ring holes (3) with the holes on the input flange.



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Figure 163. Ring Installation

4. Install the rubber element (4). Insert and hand tighten 16 M22 x 90 capscrews (5).



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Figure 164. Rubber Element Installation

5. Install the flexible coupling driving ring (6).
6. Install the special tool (7) to hold the flexible coupling driving ring from rotating.



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Figure 165. Flexible Coupling and Special Tool Installation

7. Tighten the capscrews (8) securing the flexible coupling to the input flange to a torque of 628 N•m (463 lb-ft).



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Figure 166. Tighten Bolts

Adjustment of Main Pressure

Valve Assembly 1020729:

1. Install a main pressure gauge into the port on top of the Top Valve body.
2. Remove protective cover cap located at the end of the adjusting stem. This will expose a slotted adjustment stem. Loosen the jam nut on the stem.



Figure 167. Main Pressure Regulating Valve Assembly 1021658

3. Start engine with controls in neutral.

Note: This must be done with the transmission in Neutral.

4. Turn the slotted adjustment stem clockwise to achieve the main pressure setting. [See the specifications in Description and Specifications.](#)
5. Tighten the jam nut to a torque of 20 Nm (15 Ft-lb), install the protective cap, and torque it to 14 Nm (10 Ft-lb).

NOTES:

Installation

Prior to Installation

CAUTION

Most Twin Disc products mount directly onto the flywheel of the engine, or are attached to the flywheel through external shafting or adapters. Flywheel-to-driven component interference is possible due to mismatch of components or other reasons. Therefore, engine crankshaft endplay as well as flywheel alignment checks must be made before the driven component is installed.

After installation of the driven component, the crankshaft endplay should be measured again. The endplay at the second measurement should be the same as the first. A difference in these two endplay measurements could be an indication of interference. Consequently, the driven component should be removed and the source of interference found and corrected.

Twin Disc will not be responsible for system damage caused by engine to Twin Disc component interference regardless of the cause of interference. This engine crankshaft endplay check is considered mandatory.

The transmission housing flange and pilot, the engine flywheel and the flywheel housing must be checked for trueness. Clean the engine flywheel and flywheel housing mounting surfaces thoroughly before any measurements are made.

Note: To isolate engine vibration and prevent transferring it to the hull through the propeller shaft, the distance from the marine gear output flange to a fixed stuffing box or the first fixed bearing must be a minimum of 20 times the shaft diameter. If the distance is less than this, a flexible coupling may be necessary to isolate the engine vibration.

Alignment (also reference SAE J-1033 and J-617)

1. Bolt a thousandths increment dial indicator or gauge to the engine flywheel so that the indicator is perpendicular to the face of the engine flywheel housing, and the indicator stem is riding on the face of the flange.

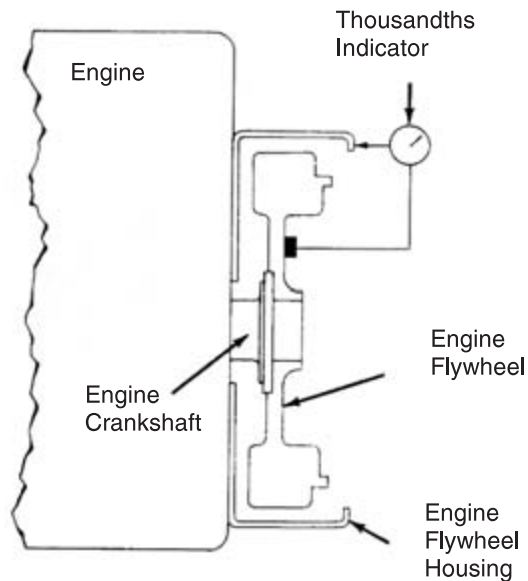


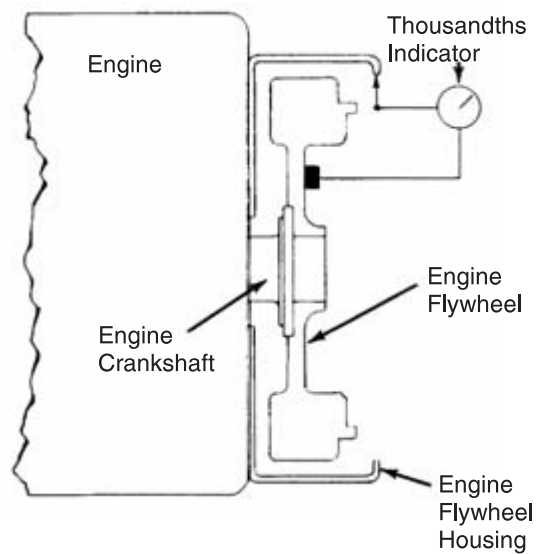
Figure 168. Checking Flywheel Housing Flange for Deviations

2. Rotate the engine flywheel, always keeping a thrust in the same direction, and note the face deviation of the engine flywheel-housing flange. The face deviation must not exceed the figures given in Table 12.

Table 12. Total Indicator Readings for Engine Flywheel Housing Flange

SAE Housing Number	Face Deviations and Bore Eccentricity mm (in)
00	0.48 (0.019)
0	0.41 (0.016)

3. With the indicator mounted as in the previous paragraph, adjust the indicator stem so that it will ride on the bore of the engine flywheel housing.

**Figure 169. Checking Flywheel Housing Bore Eccentricity**

4. Rotate the engine flywheel and note the bore eccentricity of the engine flywheel-housing bore. See Table 12 for allowable tolerances.
5. Bolt a thousandths dial indicator or gauge to the engine flywheel housing so that the indicator is perpendicular to the engine flywheel, and the indicator tip is riding on the inner face of the flywheel. Rotate the flywheel. The variation of the face runout of the surface to which the driving ring is bolted should not exceed 0.013 mm (0.0005 in.) per inch of diameter.

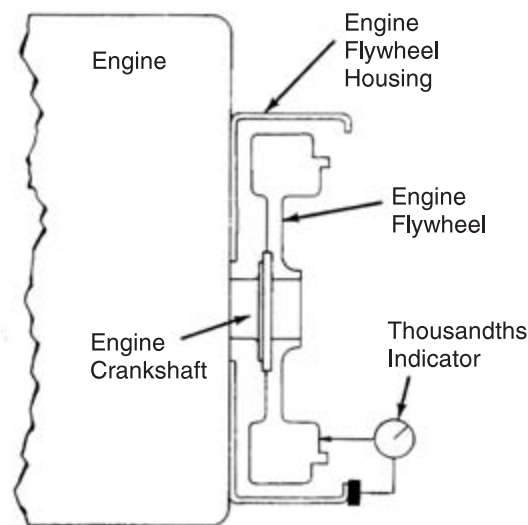


Figure 170. Checking the Flywheel Face Runout

6. With the indicator mounted as in the paragraph above, adjust the indicator tip so that it will ride on the driving ring pilot bore of the engine flywheel. Rotate the flywheel. The driving ring pilot bore eccentricity of the engine flywheel should not exceed 0.13 mm (0.005 in.) maximum total indicator reading. Thrust on the flywheel should be in one direction at all times to obtain a correct reading.

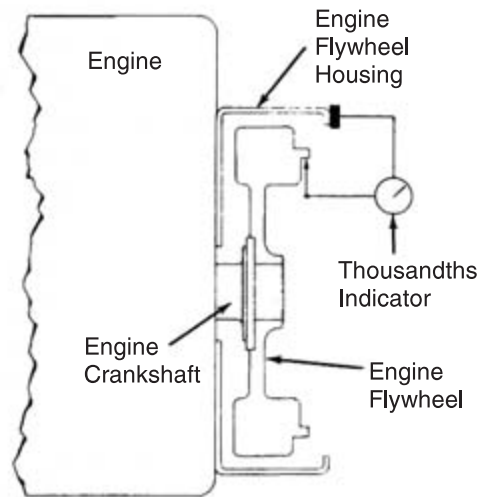


Figure 171. Checking the Flywheel Pilot Ring Bore Eccentricity

Installation

Alignment

Proper alignment of an engine and marine unit is critical, both during the initial installation and at frequent intervals during the life of the boat. It is common for a boat to change its form with various loads and with age. Engine and shaft alignment can also change on a boat due to varying loads and the boat's age. The following steps may be taken to secure proper marine transmission alignment.

When reinstalling a marine gear after a repair, or when installing a new marine gear to an engine already mounted in the bed rails, the flywheel housing should be checked for deflection using the following procedure:

1. Install the mounting brackets on the side mounting pads of the marine gear.
2. Install the driving ring on the engine flywheel. Bolt an indicator to the engine block and set the indicator stem on the engine flywheel housing.

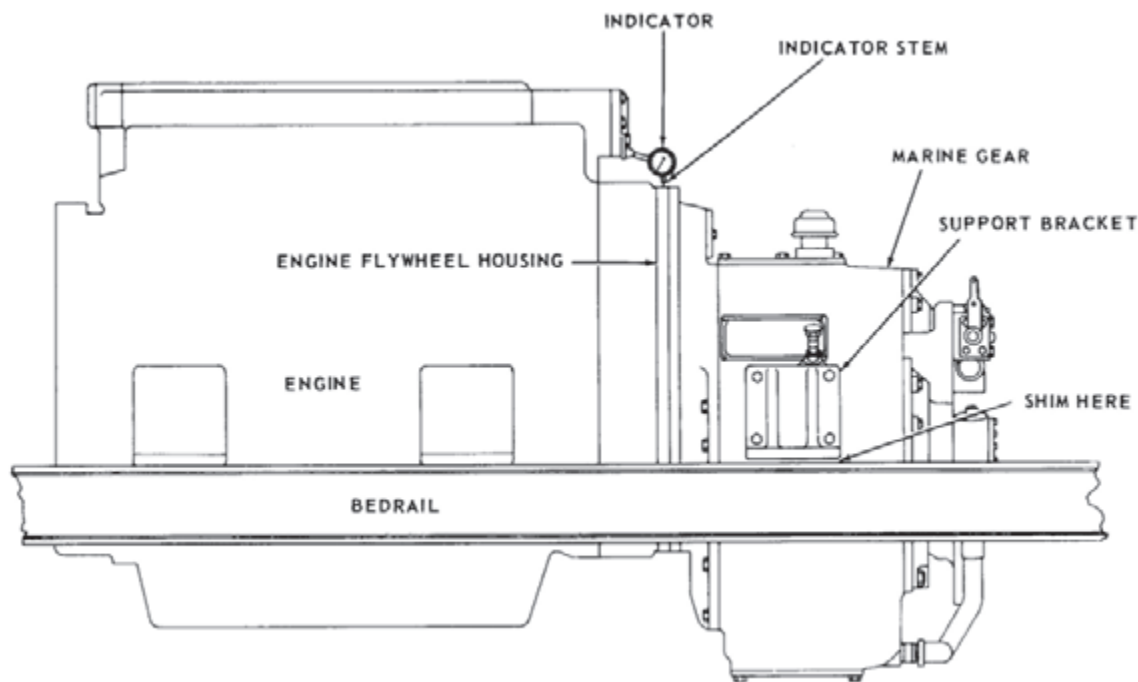


Figure 172. Marine Gear Alignment

3. Set the indicator gauge at zero (0).
4. Lift the marine gear with a hoist, or other suitable means, and place the unit in position against the engine flywheel housing.
5. Secure the flange of the marine gear main housing to the engine flywheel housing.
6. Use a feeler gauge between each mounting bracket and engine bed rail. Add shims between the brackets and bed rails to equal the feeler gauge readings.
7. Carefully release the lifting force on the marine gear while observing the indicator. The indicator gauge must remain steady at the zero mark.
8. Torque the bed bolts to the proper rating. If the reading moves from zero, lift the marine gear and insert additional shims. Continue this procedure until the marine gear is completely at rest on the bed rails and the gauge maintains a steady zero reading.
9. After obtaining the correct zero reading, indicating no distortion of the engine flywheel housing, secure the mounting brackets to the engine bed rails. Before securing the mounting brackets to the engine bed rails, the propeller shaft should be checked for alignment.

Note: The transmission output flange and companion flange bolts must be torqued to the proper value as identified in [Description and Specifications](#).

Torsional Input Coupling Alignment - Free Standing Units

Alignment of freestanding transmissions must begin by aligning the transmission output flange to the propeller shaft. The engine must then be moved to properly align the engine flywheel to the transmission input hub.

Engine and Marine Transmission Alignment

⚠ CAUTION

When mounting the engine and transmission in the boat, all of the mounting pads on both the engine and transmission must be used. Failure to do so may result in damage to the transmission or the engine flywheel housing.

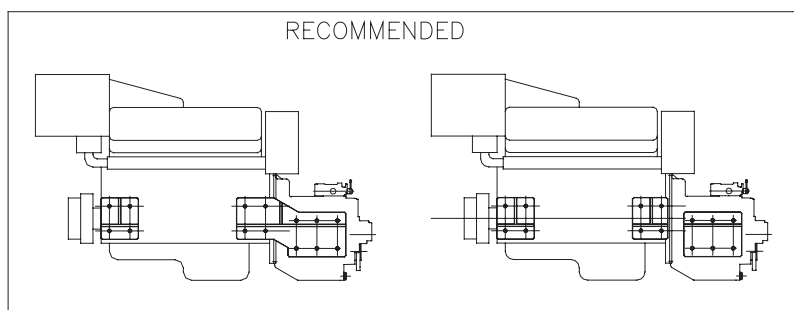


Figure 173. Recommended Transmission Mounting Configurations

When mounting the engine and transmission in the boat, all of the mounting pads on both the engine and the transmission must be used. Failure to do so may result in damage to the transmission.

It is important to align the engine and transmission only when the boat is afloat, and NOT in dry-dock. During this alignment period, it is also advisable to fill the fuel tanks and load the boat in the typical manner that it is to be used. Some boats are built with flexibility and may change shape as the loading varies.

When a heavy boat is dry-docked, it naturally undergoes some bending. Therefore, it is always good practice to unbolt the marine transmission coupling to prevent bending of the shaft.

With the engine and transmission in position on the engine bed, arrange to have a controlled lifting or lowering of each of the four corners of the engine. If threaded holes are provided in each of the engine mounts, jacking screws can be used in them. The engine can be raised by screwing down, or lowered by backing off on the jacking screws to obtain the desired adjustment.

Steel plates must be inserted under the jacking screws so that the bolts will not damage the engine bed. Lifting can also be accomplished by the use of chain hoists or properly placed jacks. Adjustable shims also are available and can simplify the alignment process, particularly for future realignment.

It may also be necessary to move the engine and transmission to one side or the other on the engine bed to obtain horizontal alignment. This can be done with a jack placed horizontally between the engine and the foundation. At the same time, a straight edge is laid across the edges of the flanges at the top and side to check the parallel alignment of the coupling edges.

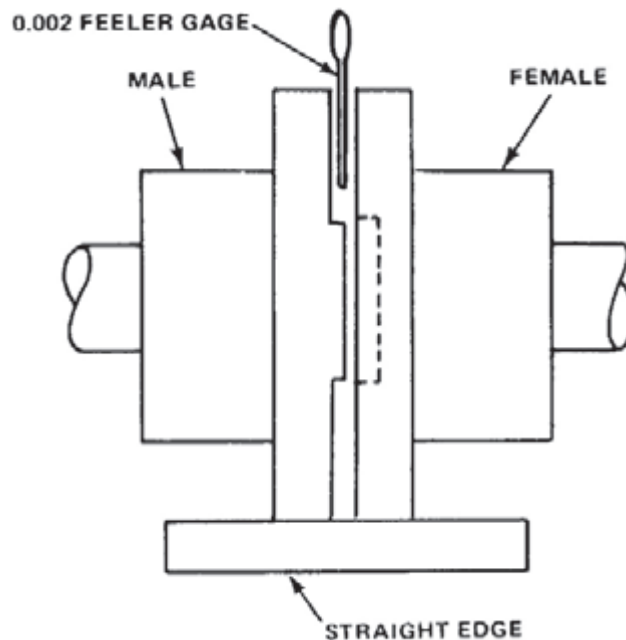


Figure 174. Checking Parallel Alignment of the Coupling

As the engine and marine transmission come into their aligned position, it will be possible to mate the output flange and propeller coupling, and prepare for bolting together. Care should be taken not to burr or mar this connection because the fit is very critical. Place a 0.05 mm (0.002 in.) feeler gauge between the flanges of the coupling. Move (slide) the feeler gauge completely around the coupling. Rotate the marine transmission flange coupling in 90 degree increments, and move the feeler gauge around the flange in each successive position. The feeler gauge will fit snugly, with the same tension, all around the flange coupling in all four positions if the alignment is correct.

If the alignment varies during rotation, additional alignment is necessary, or the marine transmission and shaft couplings should be checked for proper face runout. Runout must not exceed 0.10 mm (0.004 in.). Excessive face runout on the marine transmission output flange can usually be corrected by repositioning the coupling on its spline or taper. Excessive shaft coupling runout is usually due to inaccuracy of the taper fit or key to keyway interference. The optimum relative mating location will be where the measured runout dimensions of the transmission flange and the shaft coupling flange compliment each other to result in the least relative out of true parallel measurement.

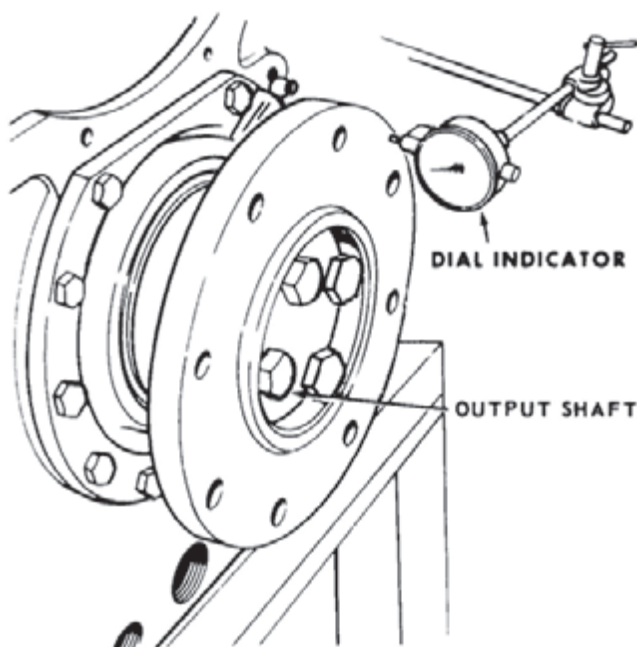


Figure 175. Checking Output Flange Face Runout

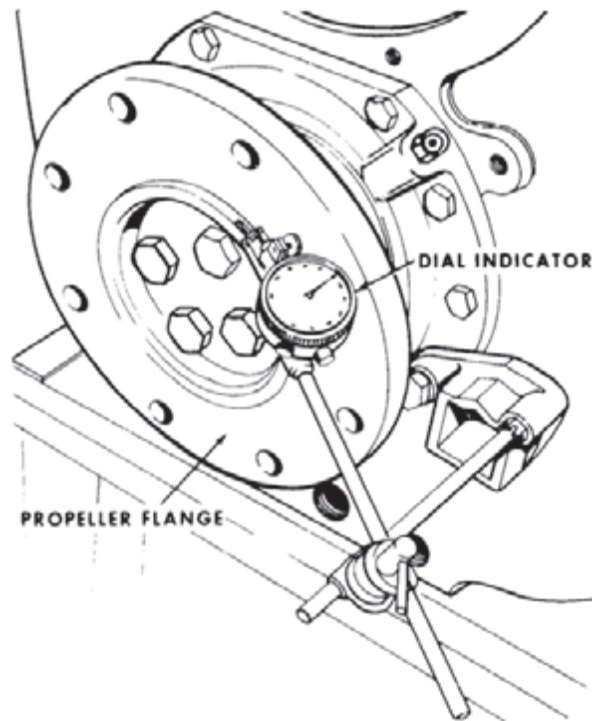


Figure 176. Checking Output Flange Pilot Eccentricity

Some boats are not structurally rigid and some carry their load in such a way that they will “hog” or go out of normal shape with every loading and unloading. Where this condition exists, it is important to apply common sense alignment techniques to minimize the potential damage to any of the components.

During the process of securing final alignment, it may be necessary to shift the engine many times. When the final alignment is accomplished, mark and drill the holes for the lag studs or locating dowel pins. Then with final alignment secured, make up the necessary poured, steel, or hardwood shims, and fasten the engine and transmission in place. Then recheck the alignment, and if satisfactory, bolt the coupling together.

There are many types of flexible couplings in the market today that solve a variety of problems:

- ☐ Couplings to reduce noise and vibration.
- ☐ Couplings to allow a permanent angular misalignment.
- ☐ Couplings that allow engines to be flexibly mounted and take out the momentary misalignment.

In some cases, the proper alignment of these couplings requires an accuracy equal to that of rigid couplings. Always use the alignment procedures recommended by the coupling manufacturer.

Propeller Shaft

Before any attempt to align the engine and gearbox to the propeller shaft, proper alignment of the propeller shaft must be determined. This includes alignment of the propeller shaft through all struts and intermediate bearings. Failure to properly align the propeller shaft may result in premature wear on bearings, vibrations, or possible damage to other components.

If the length of the shaft from the last support bearing to the gearbox is excessive or a flexible stuffing box is used, the shaft must be centered prior to engine and gearbox to propeller shaft alignment.

Transmission Controls

CAUTION

Transmission controls must be checked for proper function and alignment after any transmission selector valve is properly indexed in relation to the operator's control lever. Failure to do so could cause control system malfunction, resulting in personal injury and/or damage to equipment and property.

See specific marine transmission installation drawings for detail and dimensional information needed for the proper installation of control linkages, power engaging devices, or electrical connections.

Mechanical Controls

If the manual override valve is connected to a control cable or device, movement of the operator's selector lever to the Forward, Neutral or Reverse position must result in the transmission control valve selector being positioned in the forward, neutral or reverse detent location. Cables and linkages must be supported properly and not have any excessive slack that will allow relative movement between the operator's selector lever and the transmission control valve selector lever.

Power Controls

Selector valve positioning devices must be installed so that full travel of the actuating cylinder places the transmission selector valve in the detent position for forward or reverse, as selected, without exerting pressure on the rotational stop on the selector valve stem. Selecting Neutral must place the selector valve in the Neutral detent position. Improper installation of power engaging devices could cause failure of the selector valve stop permitting improper positioning of the selector valve and resulting in control malfunction.

Electrical Controls

All electrical wires and connectors must be adequately supported to prevent rubbing, chafing, or distress from relative movement. All electrical connections must be tight and free from any corrosion.

Wiring Connections for Optional GP Control Valve

Note: Later transmissions may have model EC050 controls replacing the profile and e-troll modules that are discussed in this manual. See EC050 Control manual #1022756 for operational and diagnostic functions, and installation issues.

General

The vessel wiring for the Profile or E-Troll Module must be of sufficient size to prevent excessive voltage drop (no greater than 0.5 VDC) between the battery connections (positive voltage and ground) and the Profile or E-Troll Module. The modules operate from nominal 12 VDC or 24 VDC batteries. The battery power connection must be protected by an electrical over-current protection component (fuse or circuit breaker) as required by the vessel's approval agency. The minimum current capacity should be 5 amps.

WARNING

DO NOT connect valve coils directly to battery power supply voltage. Use an approved Twin Disc Control System.

The customer supplied selector switches for each of the transmission clutches and for troll (if equipped) must be connected directly to the wires of the Profile or E-Troll Module, and connected to the power source as shown in the table that follows. No other electrical loads should be connected to this circuit.

Wiring Options

The following power connection schematics show the possible configurations for connecting Electronic Profile or E-Troll Module to the power source for the three possible wiring options.

- ☐ Option 1 connections are used when the Profile or E-Troll Module direction control is mechanically switched.
- ☐ Option 2 connections are used when the Profile or E-Troll Module direction control is from an electronic controller that provides switched battery positive direction outputs.
- ☐ Option 3 connections are used if the electronic propulsion controller provides switched battery negative direction outputs. Twin Disc must be consulted for additional information.

Make the following Connections

- ☐ The customer supplied normally closed not in neutral relay must be located in a position to not be affected by vibration. The coil must have a 200 maximum current draw. The coil must be connected to the two “not in neutral” wires of the Profile Generator. When the “not in neutral” circuit is not used, the following wires must be insulated and secured.
 - ☐ MGX Profile Module - Black and White wires
 - ☐ All others - Blue and Black wires
- ☐ EC200/EC250 applications: Remove weather pack connector from the control’s solenoid harness. If EC250, insulate and secure the blue and brown wires of the ASM203452 harness.
- ☐ Plug the appropriate connectors from the Profile Generator into the appropriate Proportional Valves.
- ☐ Plug the appropriate connectors from the Profile Generator into the Engine Speed sensor and the Propeller speed sensor (if equipped).
- ☐ Plug the appropriate connectors from the Profile Generator into the Temperature sensor (if equipped).
- ☐ To initiate troll without the 0.5 volt dead band at minimum troll, add a 100 ohm resistor between the potentiometer and the green wire.
- ☐ When troll speed current input is used to control trolling speed, the orange and green troll speed potentiometer input wires must be electrically connected together with a solder shrink connector. The red wire must be insulated and all three wires secured.
- ☐ When troll speed voltage input is used to control trolling speed, the violet and green wires must be insulated and secured.

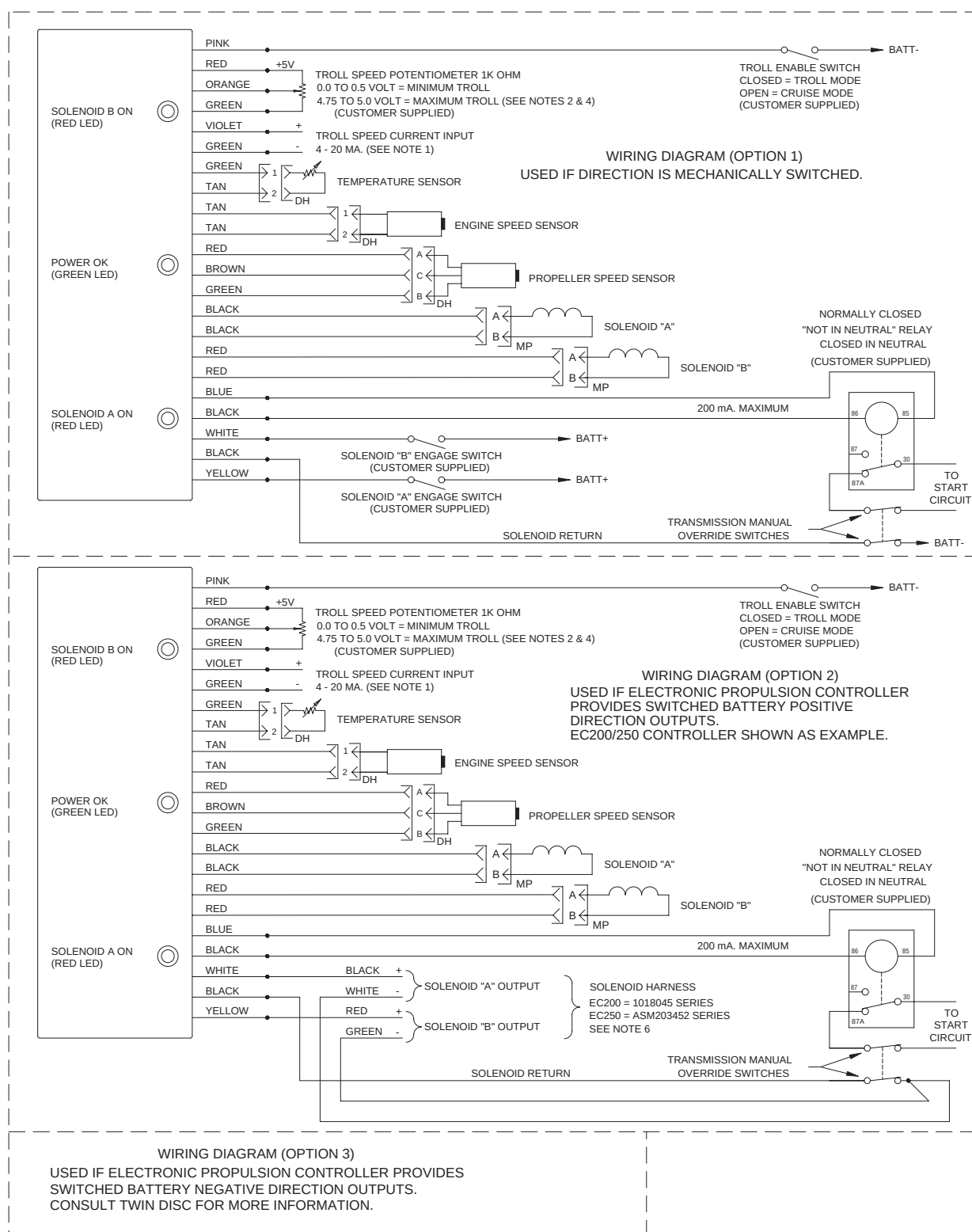


Figure 177. MG E-Troll Wiring Diagram

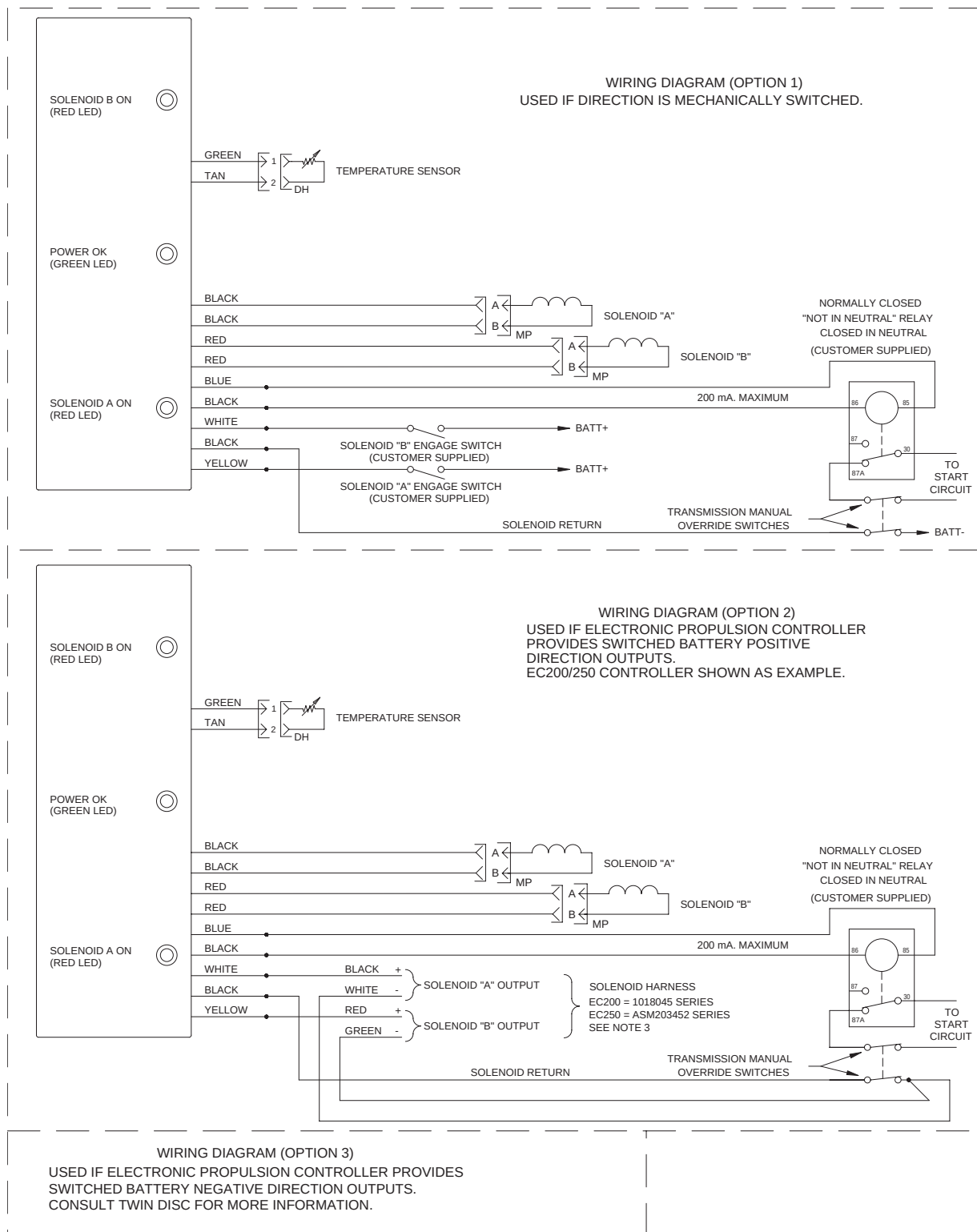


Figure 178. MG Profile Module Wiring Diagram

Final Checks

Be sure the transmission is filled with oil before starting. See Description and Specifications and Preventative Maintenance for proper oil and filling procedure.

Special Tools

List of Special Tools

The following pages include the special tool drawings that are specific to this model. The special tool drawings included are listed below and continued on the following page.

	T21482-58	Spacer for Output Gear
	T21482-59	Ram Base for Input Flange
	T21482-60	Ram Support for Input Flange
	T21482-61	Ram Base for Output Flange
	T21482-62	Ram Support for Output Shaft
	T21482-2	Ram for Output Gear to Shaft

Recommended Pump Set and Fluids

Twin Disc recommends the following products for use in the assembly and removal of tapered shafts using the oil injection method:

THAP 300 Air-Driven Pump Set

This set consists of the air-driven pump with accessories, such as an adapter block, pressure gauge, high pressure pipe, or pressure hose with quick connection couplings and connection nipples. The set includes one of each: air-driven pump [THAP 300], adapter block [226402], pressure gauge [1077589] and high pressure pipe (2m/6.5 ft.) [227957A].

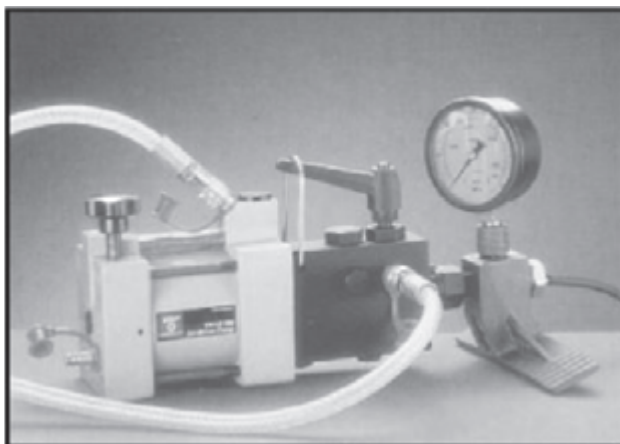


Figure 179. THAP 300 Air-driven Pump Set

Mounting Fluid LHM 300 and Dismounting Fluid LHDF 900

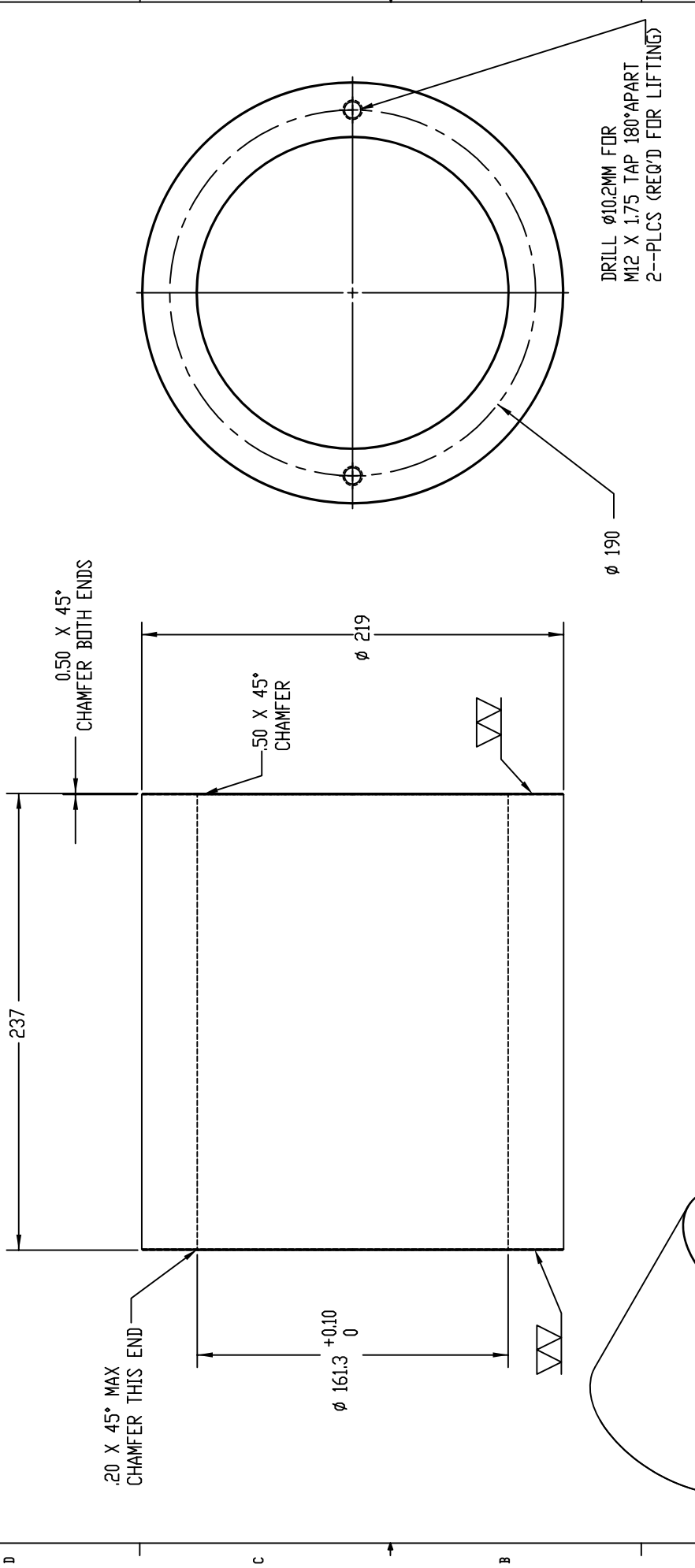
SKF LHM 300 and LHDF 900 are recommended when using SKF hydraulic equipment like hydraulic pumps. HMV nuts, oil injection equipment, etc. The fluids contain anticorrosives and are non-aggressive to seal material like nitrile rubber, Buna N (Perbunan), chrome, leather, PTFE, etc. SKF LHM 300 and LHDF 900 are available in 5 liter (5.3 qt.) cans. Designation: LHM 300/5 and LHDF 900/6.



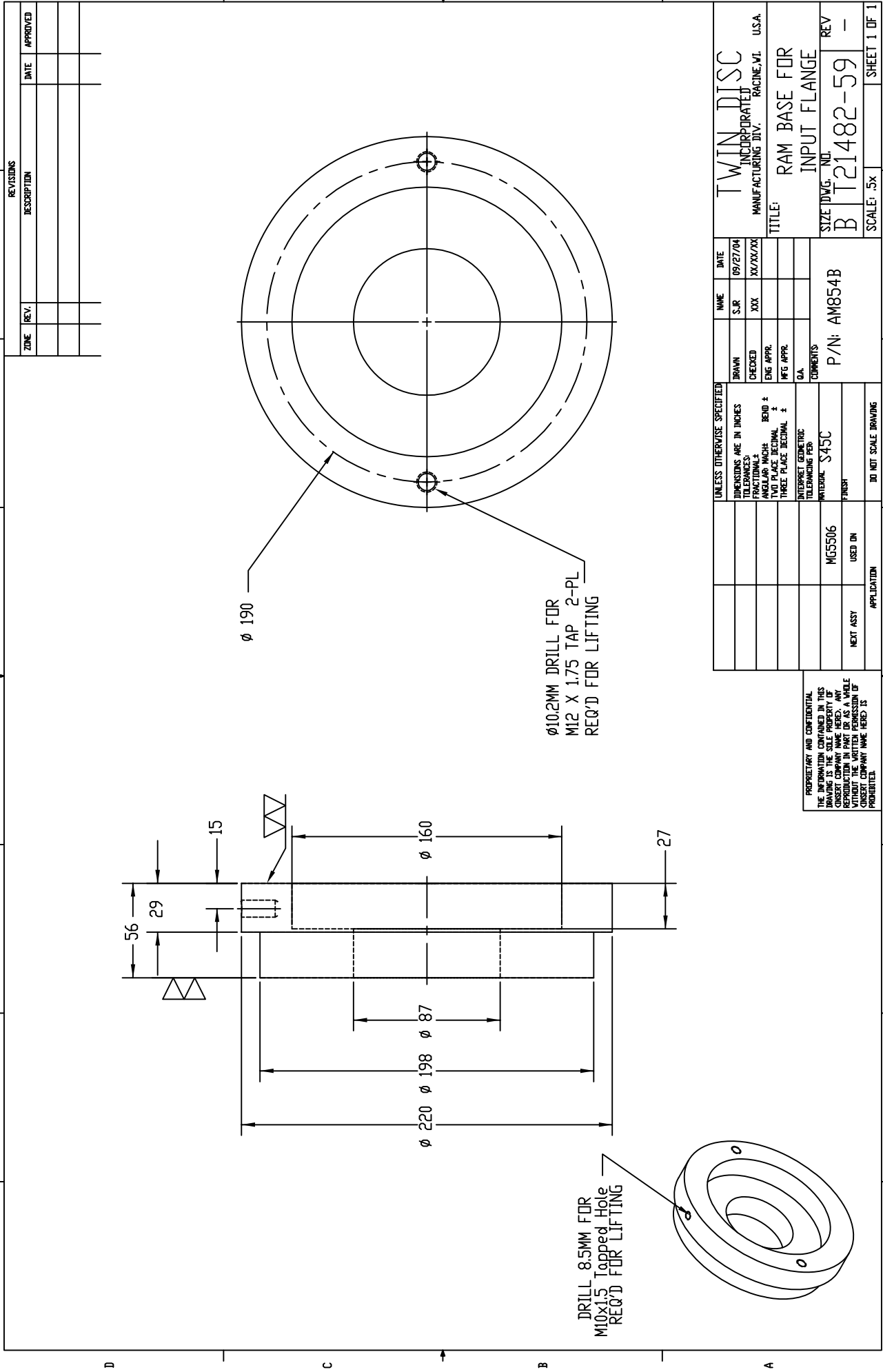
Figure 180. SKF LHM 300 and LHDF 900

Note: Order Through Your Local Authorized SKF Distributor

REVISIONS			
ZONE	REV.	DESCRIPTION	DATE



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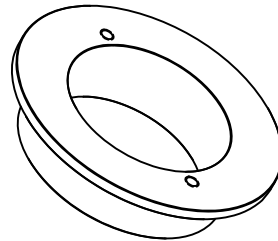


REVISIONS		
ZONE	REV.	DESCRIPTION

DATE	APPROVED

TWIN DISC INCORPORATED MANUFACTURING DIV. RACINE, WI. USA		DATE 09/27/04	NAME SJR	DATE XX/XX/XX
TITLE: RAM BASE FOR INPUT FLANGE		DESIGNED XXX	CHECKED XXX	DATE XX/XX/XX
SIZE DWG. NO. B T21482-59		ENG. APPR. XXX	WFS APPR. XXX	DATE XX/XX/XX
REV -		QA XXX	COMMENTS P/N: AM854B	DATE XX/XX/XX
SCALE: 1:5x		DO NOT SCALE DRAWING		
SHEET 1 OF 1		APPLICATION		

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Engineering Drawings

List of Engineering Drawings

The following pages include the engineering drawings that are specific to this model. The engineering drawings included are listed below and continued on the following page.

Note: Any part numbers listed in the following engineering drawings are for reference only. Please refer to your bill of material for part numbers specific to your model.

☐	739380-1	MG5506 Marine Transmission, Sectional View
☐	739380-4	MG5506 Marine Transmission, General View
☐	739582-1	MG5506 Marine Transmission, Sectional View
☐	739582-4	MG5506 Marine Transmission, General View
☐	739688-1	MG5506 Marine Transmission, Sectional View
☐	739688-4	MG5506 Marine Transmission, General View
☐	00D005604-1	MG5506 Marine Transmission, Sectional View
☐	00D005604-2	MG5506 Marine Transmission, Sectional View
☐	00D005604-3	MG5506 Marine Transmission, Sectional View
☐	00D005604-4	MG5506 Output Shaft Assembly
☐	00D005604-7	MG5506 Marine Transmission, Control Valves
☐	00D005604-8	MG5506 Marine Transmission, Heat Exchanger
☐	00D005604-9	MG5506 Marine Transmission, Trailing Pump
☐	1018084	Electric Solenoid Valve
☐	1020941	GP Valve Assembly

- ☐ 354650 Hydraulic Schematic, Manual Valve
- ☐ 354650a Hydraulic Schematic, GP Valve
- ☐ A7119W Hydraulic Schematic, Electric Solenoid Valve

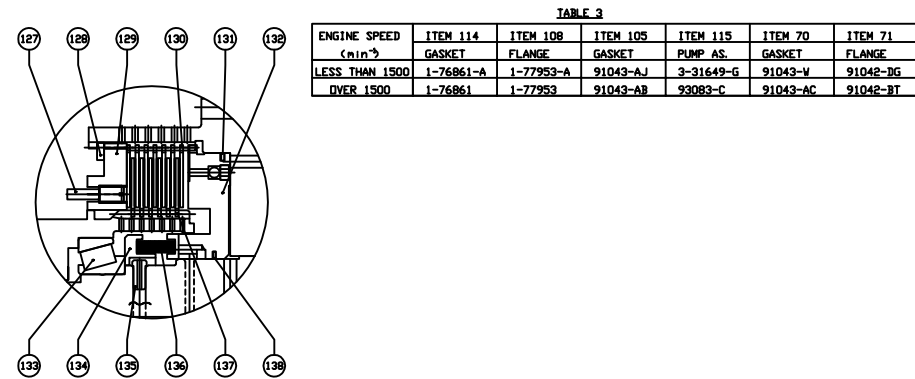


TABLE 3						
ENGINE SPEED (min ⁻¹)	ITEM 114	ITEM 108	ITEM 105	ITEM 115	ITEM 70	ITEM 71
LESS THAN 1500	1-76861-A	1-77953-A	91043-AJ	3-31649-G	91043-V	91042-BG
OVER 1500	1-76861	1-77953	91043-AB	93083-C	91043-AC	91042-BT

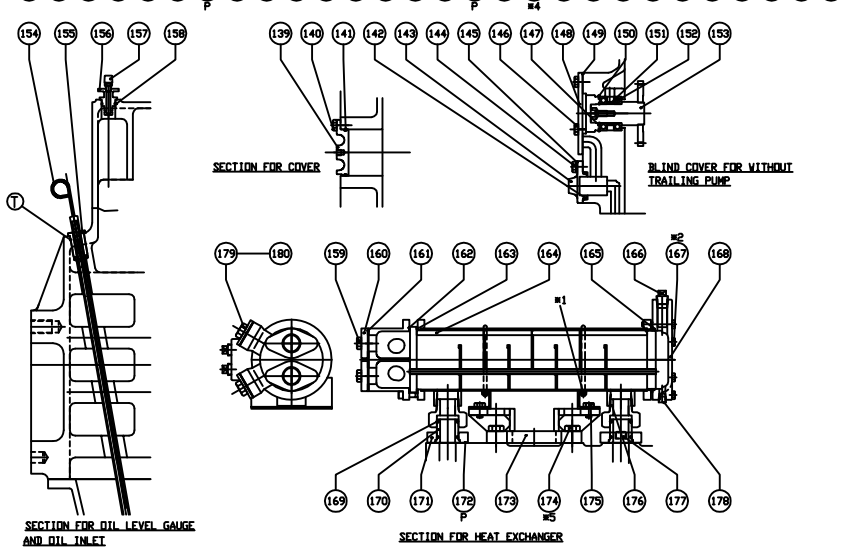
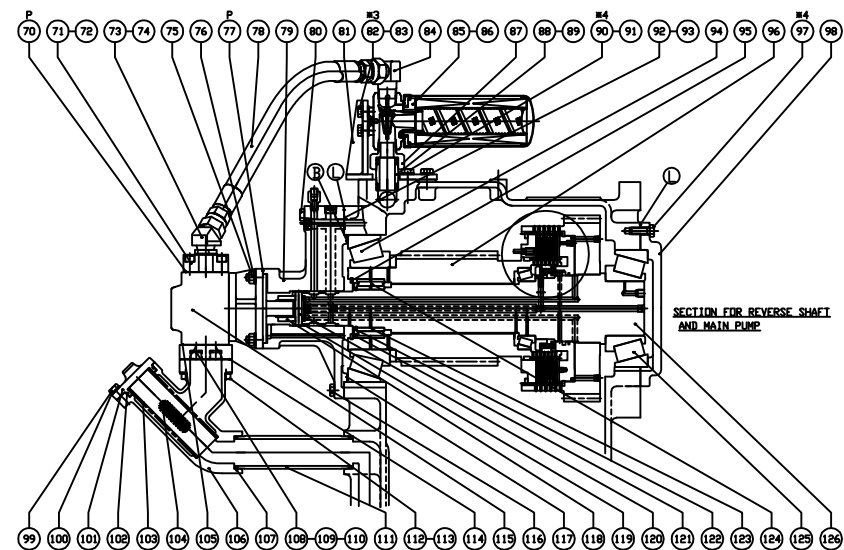
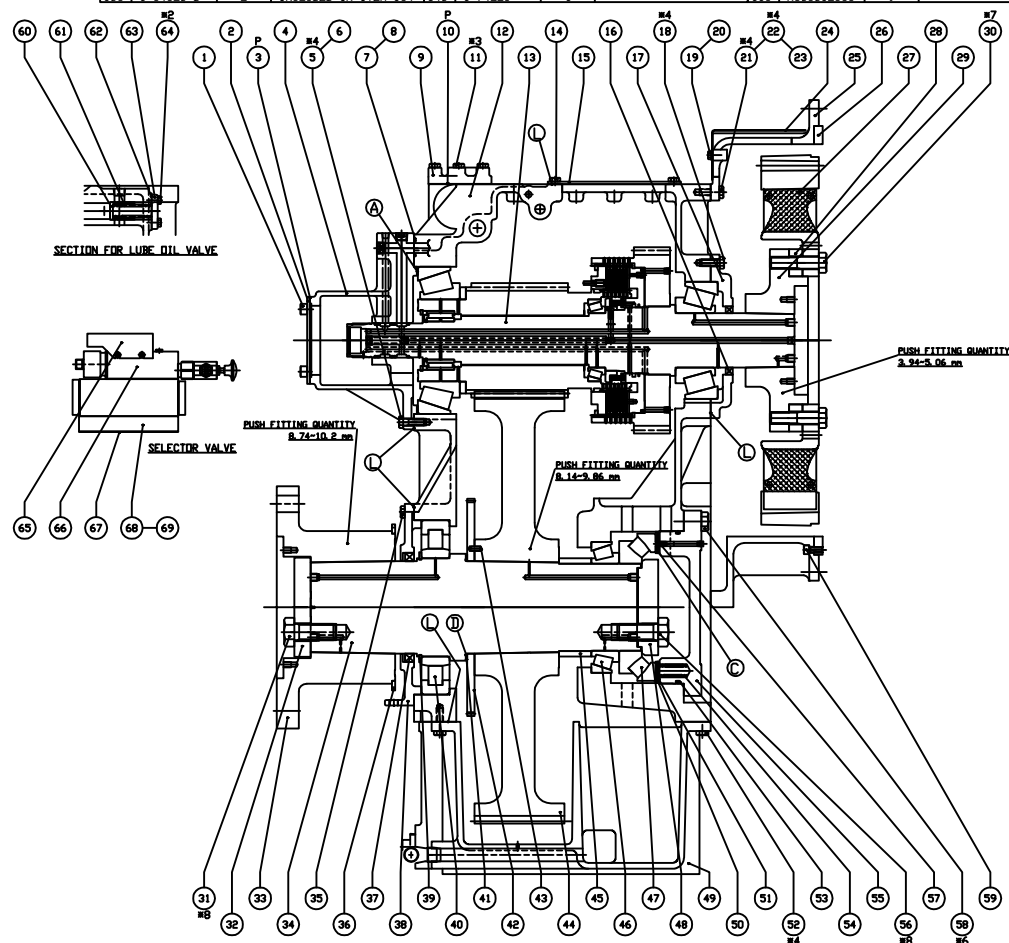


TABLE 1		
RATIO	ITEM 96	ITEM 44
4.03	3-54252	U-50345
4.55	3-54252-A	U-50347
4.96	3-54252-B	U-50348
5.44	3-54252-C	U-50360
6.00	3-54252-D	U-50349

TABLE 2		
MARK	BOLT	TIGHTENING TORQUE
M1	M8x1.25	12.5 N.m
M2	M8x1.25	21.3 N.m
M3	M10x1.5	55.0 N.m
M4	M12x1.75	96.0 N.m
M5	M16x2	236 N.m
M6	M20x2.5	461 N.m
M7	M22x2.5	628 N.m
M8	M30x3.5	1581 N.m

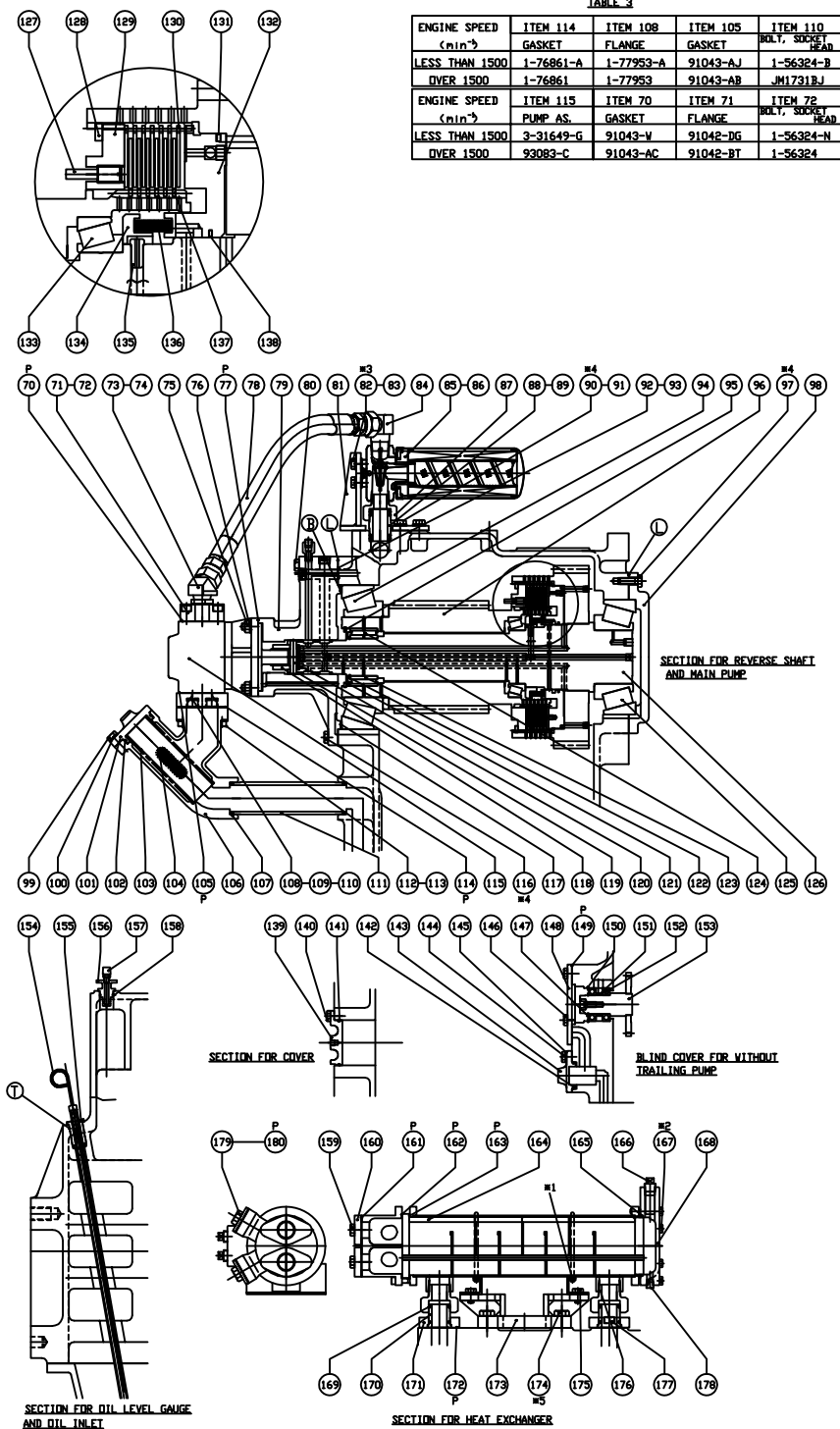
- NOTES
1. ADJUST SPACES (A), (B), (C) AND (D) FOR EACH SHAFT WITH SHIMS. SPACES (A) AND (D) SHOULD BE 0 - 0.1 mm. SPACE (B) AND (C) SHOULD BE 0 - 0.05 mm. SPACE (C) REFERS TO OTHER DRAWING 3-54251-B. USE THICK SHIM OVER 1mm ON THE SIDE OF GROOVE IF THERE IS A GROOVE.
 2. TIGHTENING TORQUE FOR MAIN IMPORTANT BOLTS SEE TABLE 2.
 3. MARKED P SHOWS SEAT PACKINGS.
 4. COAT LIQUID PACKING ON THE PORTION MARKED (Q) AND ASSEMBLE THEM.
 5. MARKED (D) SHOULD BE COATED WITH LOCTITE® #27 (RED).

ITEM	PARTS NO.	Q' TY	REMARKS	ITEM	PARTS NO.	Q' TY	REMARKS
149	1-58433-A	1		117	N46030B112	2	
150	N058006200	1		118	1-58173-B	1	
151	K330050121	1		119	N412006324	10	
152	N506007H00	2		120	1-83285	1	
153	1-72260-K	1		121	1-83279	2	
154	1-71042	1		122	N059A00700	2	
155	3-44384-B	1	INCLUDED IN ITEM 12	123	1-83192	2	
156	1-14833-A	1		124	1-83191	2	
157	1-2996-A	1		125	1-83189	2	
158	N048004030	1		126	3-54250	1	
159	N085512030	4		127	22A002658T	12	
160	1-51819-M	2		128	N421027300	2	
161	1-64583-A	2	INCLUDED IN ITEM 164	129	3-43552-D	2	
162	1-63573-K	1	INCLUDED IN ITEM 164	130	3-49762	14	
163	1-63572-Y	1	INCLUDED IN ITEM 164	131	1-8735-AW	2	
164	3-49199-B	1		132	1-77533-E	2	
165	1-63762-A	2	INCLUDED IN ITEM 164	133	1-83193	2	
166	1-55034	2		134	1-78381-C	2	
167	N085708055	6		135	1-79612-A	2	
168	3-54301	1		136	1-83256	2	
169	N048004036	4		137	3-49761-B	12	
170	1-58169-V	2		138	1-8735-F	2	
171	1-83297	2		139	1-53768	1	
172	N074007541	2		140	N085810030	1	
173	3-54272	1		141	N048010035	1	
174	N085816045	4		142	N048006043	1	
175	N085810045	4		143	1-68614-A	1	
176	1-56240-AX	2		144	N085810030	2	
177	N113810025	4		145	N031010000	2	
178	1-80389	1		146	N085810020	6	
179	1-63760-E	2	INCLUDED IN ITEM 164	147	N059003500	1	
180	1-64628-D	2	INCLUDED IN ITEM 164	148	1-74225	1	



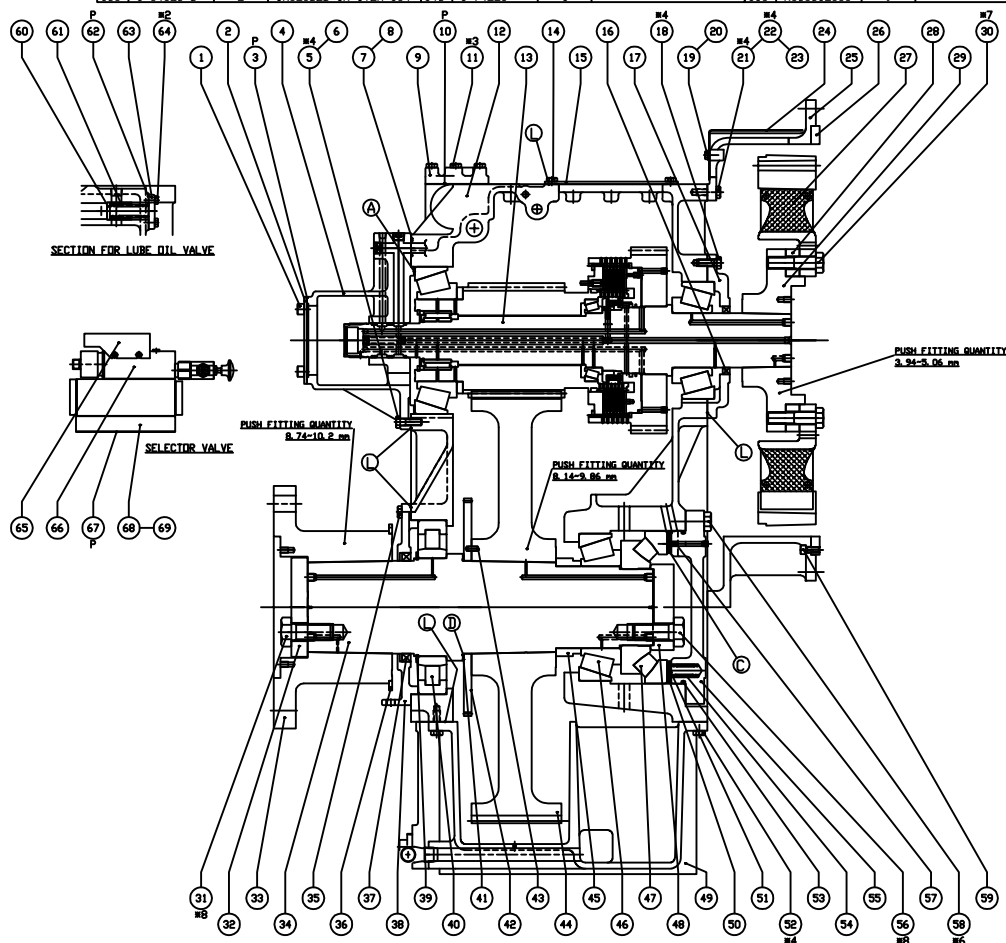
ITEM	PARTS NO.	Q' TY	REMARKS	ITEM	PARTS NO.	Q' TY	REMARKS
85	3-50064-K	1		1	1-56324-N	4	
86	1-83058-A	1	ELEMENT, FILTER	2	1-79616-C	1	
87	1-56240-AZ	1		3	1-83441	1	
88	1-58169-Z	1		4	1-83304	1	
89	N048004036	4	RING-D	5	N085812040	9	
90	N085812025	4		6	N085812085	1	BOLT
91	N031012000	4	WASHER	7	N048004055	1	RING-D G25
92	N048002055	1	RING-D P18	8	N048002055	2	RING-D P18
93	N048004055	1	RING-D G25	9	3-54264	1	
94	1-83190	2		10	1-78051	1	
95	N058010800	2		11	N085810045	6	
96	SEE TABLE 1	2		12	1-83303	1	
97	N085812035	8		13	3-54237	1	
98	3-54246	1		14	N085810020	18	
99	N085710035	3		15	3-54263	1	
100	N031010000	3		16	N048011000	1	
101	1-77952	1		17	3-54245	1	
102	N048010042	1		18	N085812035	8	
103	N050051037	1		19	N085708020	2	
104	91207-L	1		20	N031008000	2	WASHER
105	SEE TABLE 3	1		21	N085812035	12	
106	3-48714-B	1		22	N085812060	4	BOLT
107	N048006035	2		23	N340710032	2	PIN, KNOCK
108	SEE TABLE 3	1		24	1-74238-Q	1	
109	N032012000	4	WASHER	25	1-83298	1	SAE 00
110	1-56324-N	4	BOLT, SOCKET HEAD	26	1-83329	1	
111	1-58169-Y	1		27	988023988A	1	SAE30X VL4011S-2802
112	N113810045	6		28	3-54262	1	
113	N032012000	6	WASHER	29	U-50353	1	
114	SEE TABLE 3	1		30	N085822090	16	
115	SEE TABLE 3	1		31	N085830075	3	
116	N085812035	9		32	1-13623-G8	1	
33	U-50354	1		33	U-50354	1	
34	U-50343	1		34	U-50343	1	
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36	1-79375-K	1		36	1-79375-K	1	
37	N048011700	1		37	N048011700	1	
38	3-54236	1		38	3-54236	1	
39	N059018000	1		39	N059018000	1	
40	1-83194	1		40	1-83194	1	
41	N460200016	1		41	N460200016	1	
42	3-54249	1		42	3-54249	1	
43	N075080018	6		43	N075080018	6	
44	SEE TABLE 1	1		44	SEE TABLE 1	1	
45	1-83414	1		45	1-83414	1	
46	1-83195	1		46	1-83195	1	
47	1-83196	1		47	1-83196	1	
48	1-13623-GA	1		48	1-13623-GA	1	
49	1-83302	1		49	1-83302	1	
50	1-83295	1		50	1-83295	1	
51	3-54255	2		51	3-54255	2	
52	N085812035	24		52	N085812035	24	
53	N048030048	1		53	N048030048	1	
54	N050019077	6		54	N050019077	6	
55	1-83596	1		55	1-83596	1	
56	N085830075	3		56	N085830075	3	
57	N075080018	2		57	N075080018	2	
58	N085820060	16		58	N085820060	16	
59	N113810025	3		59	N113810025	3	
60	1-10305	1		60	1-10305	1	
61	N175022024	1		61	N175022024	1	
62	1-58212-A	1		62	1-58212-A	1	
63	J211651	1		63	J211651	1	
64	N085708025	4		64	N085708025	4	
65	J1020585A	1		65	J1020585A	1	
66	J1020241B	1		66	J1020241B	1	
67	3-54261	1		67	3-54261	1	
68	3-54260	1		68	3-54260	1	
69	N113810065	4	BOLT, SOCKET HEAD	69	N113810065	4	BOLT, SOCKET HEAD
70	SEE TABLE 3	1		70	SEE TABLE 3	1	
71	SEE TABLE 3	1		71	SEE TABLE 3	1	
72	1-56324-B	4	BOLT, SOCKET HEAD	72	1-56324-B	4	BOLT, SOCKET HEAD
73	1-73662-C	1		73	1-73662-C	1	
74	N048004011	1	RING-D	74	N048004011	1	RING-D
75	N089411200	4		75	N089411200	4	
76	N031012000	4	WASHER	76	N031012000	4	WASHER
77	1-50699-C	1		77	1-50699-C	1	
78	1-70034-F	1		78	1-70034-F	1	
79	1-83299	1		79	1-83299	1	
80	N085812090	1		80	N085812090	1	
81	3-54340-A	1		81	3-54340-A	1	
82	N085810020	4		82	N085810020	4	
83	JAP888AV	8		83	JAP888AV	8	
84	N205034000	1		84	N205034000	1	

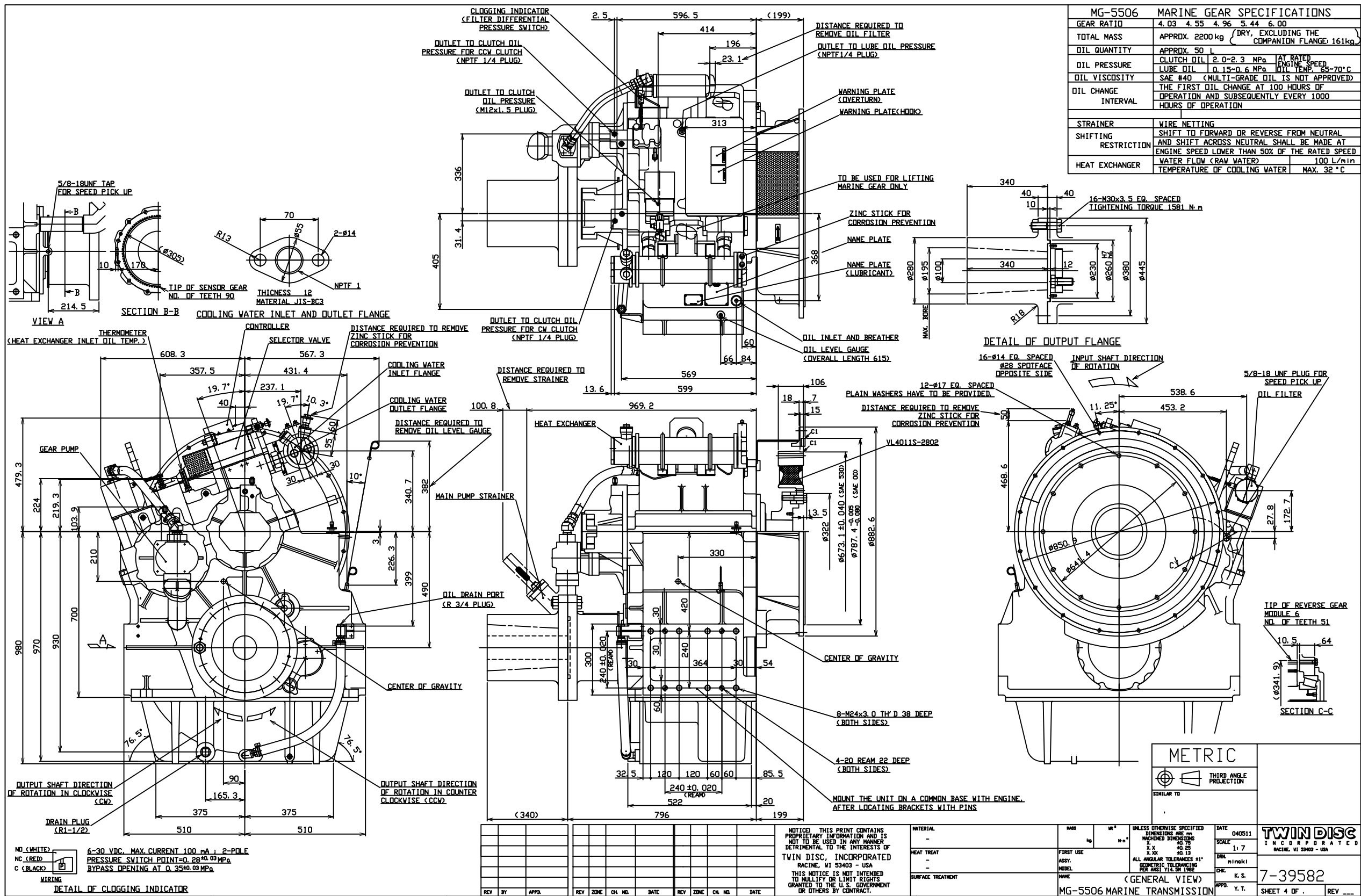
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REV: 54	REV: 54	7-39380	7-39380-1
REV: 55	REV: 55	7-3938	



ENGINE SPEED (min)	ITEM 114 GASKET	ITEM 108 FLANGE	ITEM 105 GASKET	ITEM 110 BOLT, SOCKET HEAD
LESS THAN 1500	1-76861-A	1-77953-A	91043-AJ	1-56324-B
OVER 1500	1-76861	1-77953	91043-AB	JM1731BJ
ENGINE SPEED (min)	ITEM 115 PUMP AS.	ITEM 70 GASKET	ITEM 71 FLANGE	ITEM 72 BOLT, SOCKET HEAD
LESS THAN 1500	3-31649-G	91043-V	91042-BG	1-56324-N
OVER 1500	93082-C	91043-AC	91042-BT	1-56324

ITEM	PARTS NO.	Q' TY	REMARKS	ITEM	PARTS NO.	Q' TY	REMARKS	ITEM	PARTS NO.	Q' TY	REMARKS	ITEM	PARTS NO.	Q' TY	REMARKS
149	1-58433-A	1		117	M46030B112	2		85	3-50064-K	1		1	1-56324-N	4	
150	N058006200	1		118	1-58173-B	1		86	1-83058-A	1	ELEMENT, FILTER	2	1-79616-C	1	
151	K330050121	1		119	M412006324	10		87	1-56240-AZ	1		3	1-83441	1	
152	N506007H00	2		120	1-83285	1		88	1-58169-Z	1		4	1-83304	1	
153	1-72260-K	1		121	1-83279	2		89	N048004036	4	RING-O	5	N085812040	9	
154	1-71042	1		122	N059A00700	2		90	N085812085	4		6	N085812085	1	BOLT
155	3-44384-B	1	INCLUDED IN ITEM 12	123	1-83192	2		91	N031012000	4	WASHER	7	N048004055	1	RING-O G25
156	1-14833-A	1		124	1-83191	2		92	N048002055	1	RING-O P18	8	N048002055	2	RING-O P18
157	1-2996-A	1		125	1-83189	2		93	N048004055	1	RING-O G25	9	3-54264	1	
158	N048004030	1		126	3-54250	1		94	1-83190	2		10	1-78051	1	
159	N085512030	4		127	22A002658T	12		95	N058010800	2		11	N085810045	6	
160	1-51819-M	2		128	M421027300	2		96	SEE TABLE 1	2		12	1-83303-C	1	
161	1-64583-A	2	INCLUDED IN ITEM 164	129	3-43552-D	2		97	N085812035	8		13	3-54237	1	
162	1-63573-K	1	INCLUDED IN ITEM 164	130	3-49742	14		98	3-54246	1		14	N085810020	18	
163	1-63572-Y	1	INCLUDED IN ITEM 164	131	1-8735-AW	2		99	N085710035	3		15	3-54263	1	
164	3-49199-B	1		132	1-77533-E	2		100	N031010000	3		16	N408011000	1	
165	1-63762-A	2	INCLUDED IN ITEM 164	133	1-83193	2		101	1-77952	1		17	3-54245	1	
166	1-55034	2		134	1-78381-C	2		102	N048010042	1		18	N085812035	8	
167	N085708055	6		135	1-79612-A	2		103	N050051037	1		19	N085708020	2	
168	3-54301	1		136	1-83256	2		104	91207-L	1		20	N031008000	2	WASHER
169	N048004036	4		137	3-49761-B	12		105	SEE TABLE 3	1		21	N085812035	12	
170	1-58169-V	2		138	1-8735-F	2		106	3-48714-B	1		22	N085812060	4	BOLT
171	1-83297	2		139	1-53768	1		107	N048006035	2		23	N340710032	2	PIN, KNOCK
172	N074007541	2		140	N085810030	1		108	SEE TABLE 3	1		24	1-74238-Q	1	
173	3-54272	1		141	N048010035	1		109	N032012000	4	WASHER	25	1-83239	1	SAFE DO
174	N085816045	4		142	N048006043	1		110	SEE TABLE 3	4		26	1-83329	1	
175	N085810020	4		143	1-68614-A	1		111	1-58169-Y	1		27	988023988A	1	SAE330C VL4011S-2802
176	1-56240-AX	2		144	N085710030	2		112	N113810045	6		28	3-54262	1	
177	N113812025	4		145	N031010000	2		113	N032012000	6	WASHER	29	U-50353	1	
178	1-80389	1		146	N085810025	6		114	SEE TABLE 3	1		30	N085822090	16	
179	1-63760-E	2	INCLUDED IN ITEM 164	147	N059003500	1		115	SEE TABLE 3	1		31	N085830075	3	
180	1-64628-D	2	INCLUDED IN ITEM 164	148	1-74225	1		116	N085812035	9		32	1-13623-G8	1	





6

5

4

3

2

1

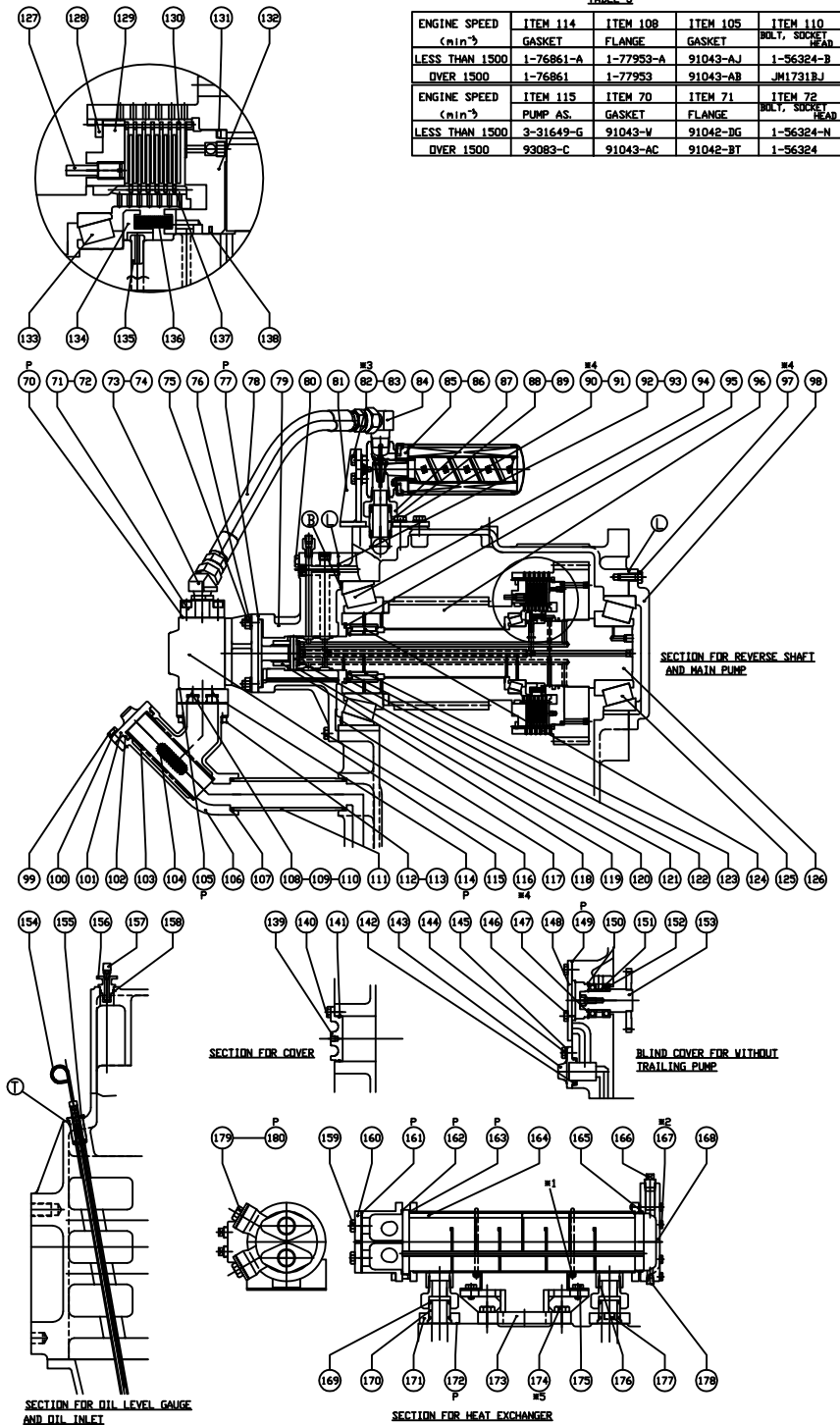


TABLE 3				
ENGINE SPEED (min ⁻¹)	ITEM 114	ITEM 108	ITEM 105	ITEM 110
LESS THAN 1500	GASKET	FLANGE	GASKET	BOLT, SOCKET HEAD
OVER 1500	1-76861-A	1-77953-A	91043-AJ	1-56324-B
ENGINE SPEED (min ⁻¹)	ITEM 115	ITEM 70	ITEM 71	ITEM 72
LESS THAN 1500	PUMP AS.	GASKET	FLANGE	BOLT, SOCKET HEAD
OVER 1500	3-31649-G	91043-V	91042-BG	1-56324-N
	93083-C	91043-AC	91042-BT	1-56324

ITEM	PARTS NO.	Q' TY	REMARKS	ITEM	PARTS NO.	Q' TY	REMARKS	ITEM	PARTS NO.	Q' TY	REMARKS	ITEM	PARTS NO.	Q' TY	REMARKS
149	1-58433-A	1		117	N46030B112	2		85	3-50064-K	1		1	1-56324-N	4	
150	N580006200	1		118	1-58173-B	1		86	1-83058-A	1	ELEMENT, FILTER	2	1-79616-C	1	
151	K330050121	1		119	N412006324	10		87	1-56240-AZ	1		3	1-83441	1	
152	N506007H00	2		120	1-83285	1		88	1-58169-Z	1		4	1-83304	1	
153	1-72260-K	1		121	1-83279	2		89	N048004036	4	RING-D	5	N085812040	9	
154	1-71042	1		122	N059A00700	2		90	N085812025	4		6	N085812085	1	BOLT
155	3-44384-B	1	INCLUDED IN ITEM 12	123	1-83192	2		91	N031012000	4	WASHER	7	N048004055	1	RING-D G25
156	1-14833-A	1		124	1-83191	2		92	N048002055	1	RING-D P18	8	N048002055	2	RING-D P18
157	1-2996-A	1		125	1-83189	2		93	N048004055	1	RING-D G25	9	3-54264	1	
158	N048004030	1		126	3-54250	1		94	1-83190	2		10	1-78051	1	
159	N085512030	4		127	22A002658T	12		95	N058010800	2		11	N085810045	6	
160	1-51819-M	2		128	N421027300	2		96	SEE TABLE 1	2		12	1-83303-C	1	
161	1-64583-A	2	INCLUDED IN ITEM 164	129	3-43552-D	2		97	N085812035	8		13	3-54237	1	
162	1-63573-K	1	INCLUDED IN ITEM 164	130	3-49762	14		98	3-54246	1		14	N085810020	18	
163	1-63572-Y	1	INCLUDED IN ITEM 164	131	1-8735-AW	2		99	N085710035	3		15	3-54263	1	
164	3-49199-B	1		132	1-77533-E	2		100	N031010000	3		16	N408011000	1	
165	1-63762-A	2	INCLUDED IN ITEM 164	133	1-83193	2		101	1-77952	1		17	3-54245	1	
166	1-55034	2		134	1-78381-C	2		102	N048010042	1		18	N085812035	8	
167	N085708055	6		135	1-79612-A	2		103	N050051037	1		19	N085708020	2	
168	3-54301	1		136	1-83256	2		104	91207-L	1		20	N031008000	2	WASHER
169	N048004036	4		137	3-49761-B	12		105	SEE TABLE 3	1		21	N085812035	12	
170	1-58169-V	2		138	1-8735-F	2		106	3-48714-B	1		22	N085812060	4	BOLT
171	1-83297	2		139	1-53768	1		107	N048006035	2		23	N340710032	2	PIN, KNOCK
172	N074007541	2		140	N085810030	1		108	SEE TABLE 3	1		24	1-74228-Q	1	
173	3-54272	1		141	N048010035	1		109	N032012000	4	WASHER	25	1-83298	1	SAFE DO
174	N085816045	4		142	N048006043	1		110	SEE TABLE 3	4		26	1-83329	1	
175	N085810020	4		143	1-68614-A	1		111	1-58169-Y	1		27	988023988A	1	SAE30X VL4011S-2802
176	1-56240-AX	2		144	N085710030	2		112	N113810045	6		28	3-54262	1	
177	N113810025	4		145	N031010000	2		113	N032012000	6	WASHER	29	U-50353	1	
178	1-80389	1		146	N085810025	6		114	SEE TABLE 3	1		30	N085822090	16	
179	1-63760-E	2	INCLUDED IN ITEM 164	147	N059003500	1		115	SEE TABLE 3	1		31	N085830075	3	
180	1-64628-D	2	INCLUDED IN ITEM 164	148	1-74225	1		116	N085812035	9		32	1-13623-GB	1	

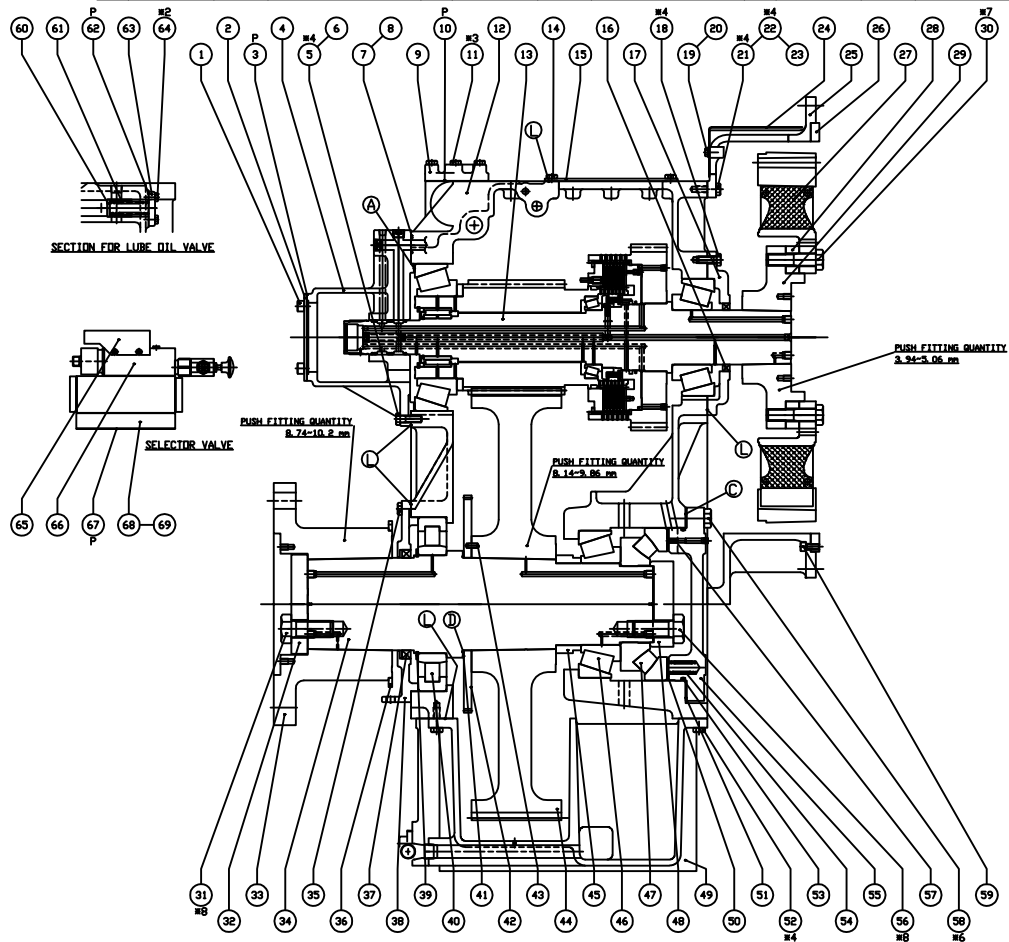


TABLE 1		
RATIO	ITEM 96	ITEM 44
4.03	3-54252	U-50345
4.55	3-54252-A	U-50347
4.96	3-54252-B	U-50348
5.44	3-54252-C	U-50360
6.00	3-54252-D	U-50349

TABLE 2		
MARK	BOLT	TIGHTENING TORQUE
M1	M8x1.25	12.5 N.m
M2	M8x1.25	21.3 N.m
M3	M10x1.5	55.0 N.m
M4	M12x1.75	96.0 N.m
M5	M16x2	236 N.m
M6	M20x2.5	461 N.m
M7	M22x2.5	628 N.m
M8	M30x3.5	1581 N.m

NOTES

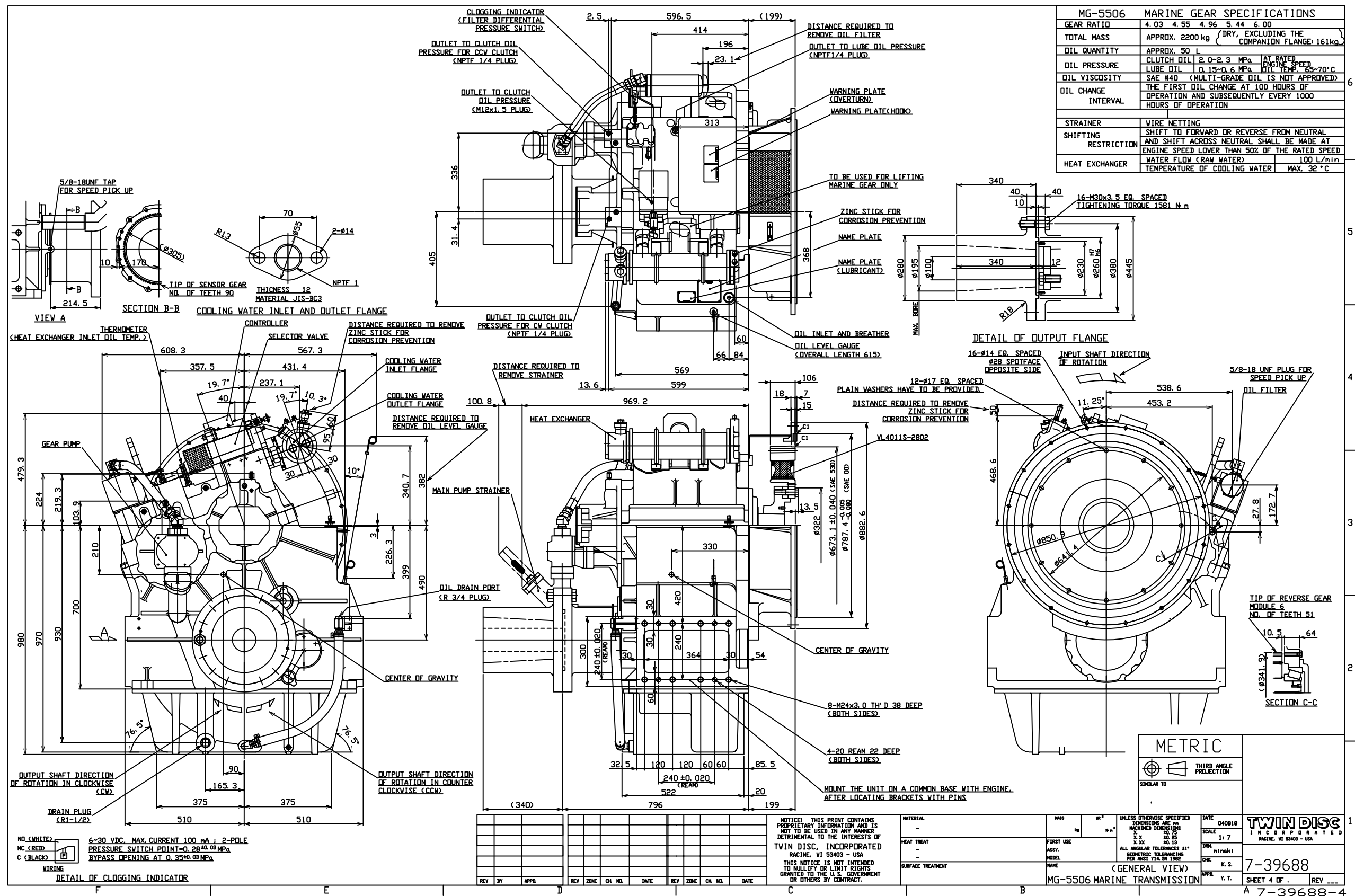
- ADJUST SPACES (A), (B), (C) AND (D) FOR EACH SHAFT WITH SHIMS. SPACES (A) AND (B) SHOULD BE 0 - 0.1 mm. SPACE (C) SHOULD BE -0.05-0 mm. REFERS TO OTHER DRAWING 3-54251-B. SPACE (D) REFERS TO OTHER DRAWING 3-54968. USE THICK SHIM (OVER 1mm) ON THE SIDE OF GROOVE IF THERE IS A GROOVE.
- FIGURES IN THE DRAWING SHOW TIGHTENING TORQUE FOR MAIN IMPORTANT BOLTS.
- MARKED (C) SHOWS SEAT PACKINGS.
- COAT LIQUID PACKING ON THE PORTION MARKED (C) AND ASSEMBLE THEM.
- MARKED (C) SHOULD BE COATED WITH LOCTITE® #277 (RED).

REV	BY	APP	REV	DATE	CH	NO.	DATE	CH	NO.	DATE

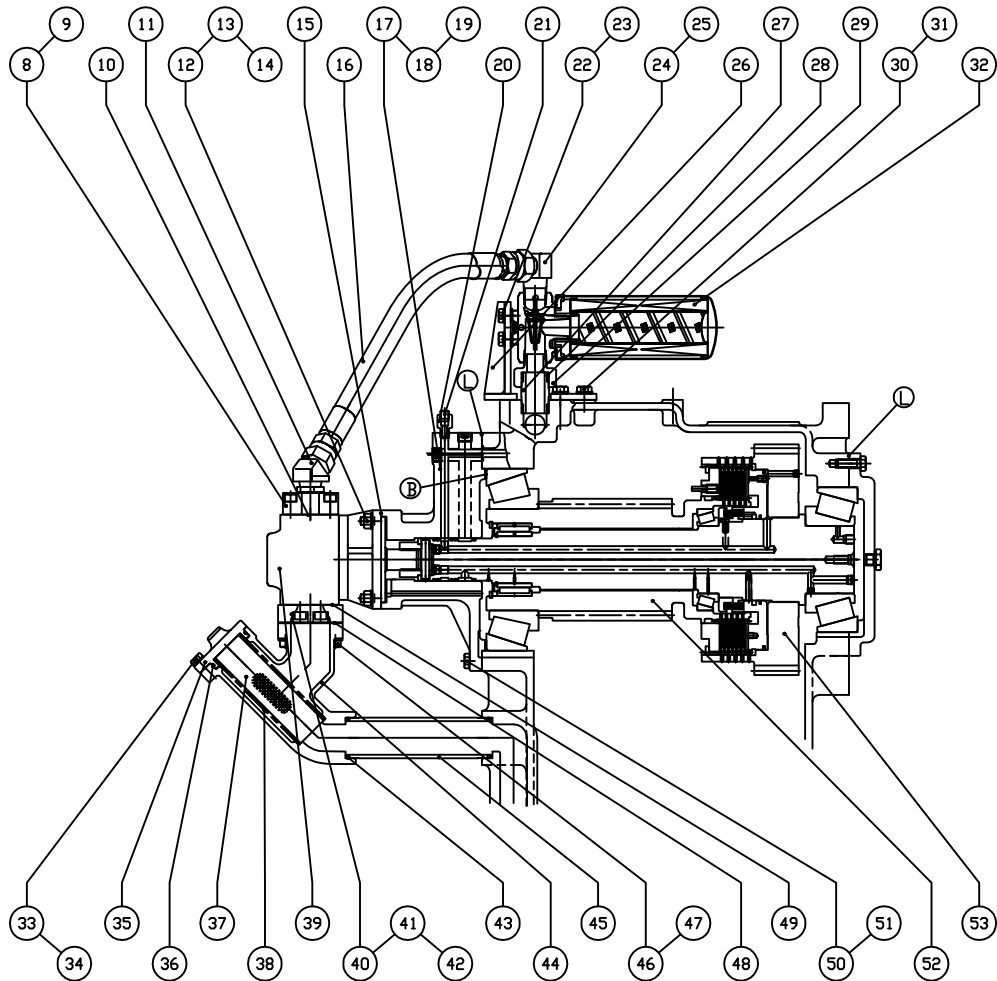
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REVISION	DATE	BY	APP	REVISION	DATE	BY	APP

METRIC		TWIN DISC INCORPORATED	
SCALE: 1:4	DATE: 04/08/10	REV: 1	REV: 1
7-39688	7-39688-1	MG-5506	MG-5506



MG-5506		MARINE GEAR SPECIFICATIONS	
GEAR RATIO	4.03 4.55 4.96 5.44 6.00		
TOTAL MASS	APPROX. 2200 kg (DRY, EXCLUDING THE COMPANION FLANGE; 161kg)		
OIL QUANTITY	APPROX. 50 L		
OIL PRESSURE	CLUTCH OIL 2.0-2.3 MPa AT RATED ENGINE SPEED LUBE OIL 0.15-0.6 MPa OIL TEMP. 65-70°C		
OIL VISCOSITY	SAE #40 (MULTI-GRADE OIL IS NOT APPROVED)		
OIL CHANGE INTERVAL	THE FIRST OIL CHANGE AT 100 HOURS OF OPERATION AND SUBSEQUENTLY EVERY 1000 HOURS OF OPERATION		
STRAINER	WIRE NETTING		
SHIFTING RESTRICTION	SHIFT TO FORWARD OR REVERSE FROM NEUTRAL AND SHIFT ACROSS NEUTRAL SHALL BE MADE AT ENGINE SPEED LOWER THAN 50% OF THE RATED SPEED		
HEAT EXCHANGER	WATER FLOW (RAW WATER) 100 L/min TEMPERATURE OF COOLING WATER MAX. 32°C		



SECTION FOR REVERSE SHAFT
AND MAIN PUMP

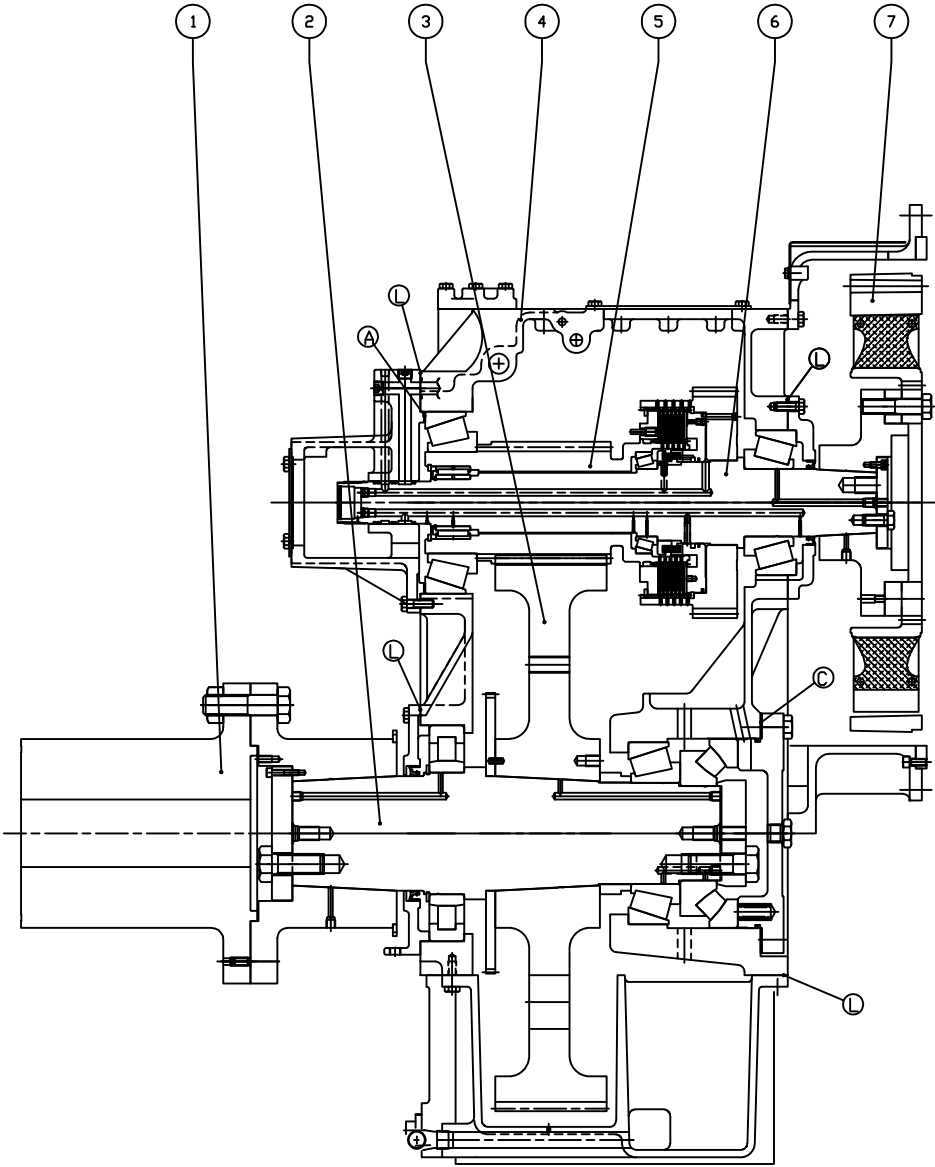


TABLE 1			
GEAR RATIO	BOM No.	ITEM 4, 51 PINION AS.	ITEM 3 WHEEL
4. 03	2A021661	22C013103	22B032272
4. 55	2A021661A	25B032302E	22B032273
4. 96	2A021661B	25B032302F	22B032274
5. 44	2A021661C	25B032302B	22B032275
6. 00	2A021661D	25B032302D	22B032276

TABLE 2		
MARKS	BOLT	TIGHTENING TORQUE
※1	M8x1. 25	12. 5 N·m
※2	M8x1. 25	21. 3 N·m
※3	M10x1. 5	55. 0 N·m
※4	M12x1. 75	96. 0 N·m
※5	M16x2	236 N·m
※6	M20x2. 5	461 N·m
※7	M22x2. 5	628 N·m
※8	M30x3. 5	1581 N·m

TABLE 3									
ENGINE SPEED (rpm)	BOM No.	ITEM 48 GASKET	ITEM 40 FLANGE	ITEM 49 GASKET	ITEM 42 BOLT, SOCKET HEAD	ITEM 39 PUMP AS.	ITEM 10 GASKET	ITEM 8 FLANGE	ITEM 9 BOLT, SOCKET HEAD
LESS THAN 1500	2A021263B	1-76861-A	1-77953-A	91043-AJ	1-56324-N	3-31649-G	91043-W	91042-DG	1-56324-B
OVER 1500	2A021263A	1-76861	1-77953	91043-AB	1-56324	93083-C	91043-AC	91042-BT	JM1732BJ

NOTES

1. ADJUST SPACES (A), (B) AND (C) FOR EACH SHAFT WITH SHIMS.
SPACES (A) AND (B) SHOULD BE 0 ~ 0.1 mm.
SPACE (C) SHOULD BE 0~0.05 mm.
USE THICK SHIM(0VER 1mm) ON THE SIDE OF GROOVE IF THERE IS A GROOVE.
2. FIGURES IN THE DRAWING SHOW TIGHTENING TORQUE FOR MAIN IMPORTANT BOLTS.
3. MARKED (D) SHOWS SEAT PACKINGS.
4. COAT LIQUID PACKING ON THE PORTION MARKED (Q) AND ASSEMBLE THEM.

REV	BY	APPD.

REV	ZONE	CH. NO.	DATE

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MATERIAL
-
HEAT TREAT
-
SURFACE TREATMENT

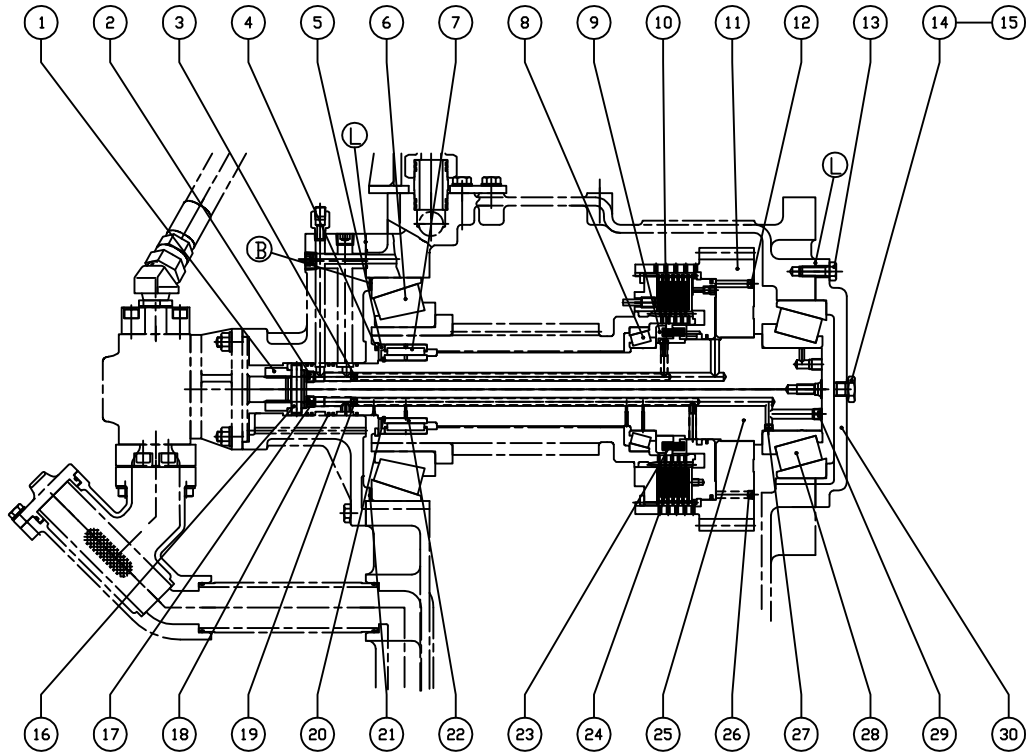
MASS
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FIRST USE
ASSY.
MODEL
NAME

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN:
MACHINED DIMENSIONS
X X
X X
X X
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING PER ANSI Y14.5M 1992

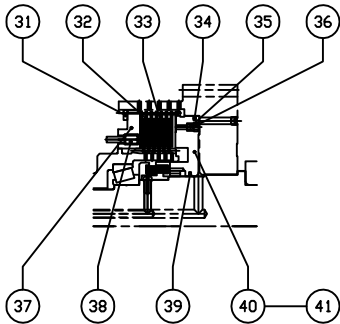
DATE
060105
SCALE
1: 5
DRN
N. Miyata
CHK
H. Tsunekawa
APPD.
Y. Kaneko

TWIN DISC
INCORPORATED
RACINE, WI 53403 - USA
00D005604-1
SHEET 1 OF 1
REV

ITEM	PARTS NO.	N A M E	Q' TY	REMARKS
1	00D005604J	COMPANION FLANGE OPTION	1	SEE 00D005604J
2	00D005604D	OUTPUT SHAFT GROUP	1	SEE 00D005604D
3	SEE TABLE1	GEAR RATIO GROUP	1	WHEEL
4	00D005604F	HOUSING GROUP	1	SEE 00D005604F
5	SEE TABLE1	GEAR RATIO GROUP	1	PINION AS
6	00D005604B	INPUT SHAFT GROUP	1	SEE 00D005604B
7	00D005604E	INPUT GROUP OPTION	1	SEE 00D005604E
8	SEE TABLE3	FLANGE	1	
9	SEE TABLE3	BOLT, SOCKET HEAD	4	※3
P 10	SEE TABLE3	GASKET	1	
11	1-73662-C	ELBOW	1	
12	N089411200	NUT	4	※4
13	N098512032	STUD	4	
14	N031012000	WASHER	4	
P 15	221015138	GASKET	1	
16	1-70034-F	HOSE, RUBBER	1	
17	5-51940	MDUNT, PUMP	1	
18	N048002055	RING-D	1	P-18
19	N048004055	RING-D	1	P-25
20	1-71623-B	ADAPTER	1	Rc1/4-NPTF1/4
21	1-71622-A	PLUG	1	NPTF1/4
22	N085710025	BOLT	4	※3
23	JA2888AV	WASHER	8	
24	N205034000	ELBOW	1	
25	N048004011	RING-D	1	P-29
26	3-54340-A	PLATE, CLAMP	1	
27	1-58169-Z	PIPE, CONNECTING	1	
28	N048004036	RING-D	4	G-35
29	1-56240-AZ	BUSH	1	
30	N085712025	BOLT	4	※4
31	N031012000	WASHER	4	
32	3-50064-K	FILTER AS.	1	
33	N085710035	BOLT	3	※3
34	N031010000	WASHER	3	
35	1-77952	COVER	1	
36	N048010042	RING-D	1	G-65
37	91207-L	STRAINER	1	
38	N050051037	SPRING	1	
39	SEE TABLE3	PUMP AS.	1	
40	SEE TABLE3	FLANGE	1	
41	N032012000	WASHER	4	
42	SEE TABLE3	BOLT, SOCKET HEAD	4	※3
43	N048006035	RING-D	2	G-55
44	3-48714-B	CASE, STRAINER	1	
45	1-58169-Y	TUBE, SUCTION	1	
46	N113810045	BOLT, SOCKET HEAD	6	※3
47	N032012000	WASHER	6	
P 48	SEE TABLE3	GASKET	1	
P 49	SEE TABLE3	GASKET	1	
50	N085712040	BOLT	9	※4
51	N085712090	BOLT	1	※4
52	SEE TABLE1	GEAR RATIO GROUP	1	PINION AS
53	00D005604C	CLUTCH SHAFT GROUP	1	SEE 00D005604C



CLUTCH SHAFT GROUP(STANDARD TYPE)
BOM No. 2A021319



CLUTCH GROUP
BOM No. 5A007014

TABLE 2

MARKS	BOLT	TIGHTENING TORQUE
*1	M8x1.25	12.5 N·m
*2	M8x1.25	21.3 N·m
*3	M10x1.5	55.0 N·m
*4	M12x1.75	96.0 N·m
*5	M16x2	236 N·m
*6	M20x2.5	461 N·m
*7	M22x2.5	628 N·m
*8	M30x3.5	1581 N·m

NOTES

- ADJUST SPACES (B) FOR EACH SHAFT WITH SHIMS.
SPACES (B) SHOULD BE 0 ~ 0.1 mm.
USE THICK SHIM(0.1mm) ON THE SIDE OF GROOVE IF THERE IS A GROOVE.
- FIGURES IN THE DRAWING SHOW TIGHTENING TORQUE FOR MAIN IMPORTANT BOLTS.(SEE TABLE 2)
- MARKED (P) SHOWS SEAT PACKINGS.
- COAT LIQUID PACKING ON THE PORTION MARKED (C) AND ASSEMBLE THEM.

ITEM	PARTS NO.	N A M E	Q' TY	REMARKS
1	22A020825B	BLOCK, PUMP DRIVE	1	
2	N141413000	PLUG, SCREW	3	
3	N141410032	PLUG, DRIFICE	1	#3.2
4	N058010800	RING, SNAP	1	
5	1-83279	SHROUD	1	
6	1-83190	BEARING, TAPERED ROLLER	1	
7	1-83191	BEARING, NEEDLE ROLLER	1	OUTER
8	1-83193	BEARING, TAPERED ROLLER	1	
9	1-78381-C	DISC	1	
10	22A024987	PIN, KNOCK	1	
11	22C013006A	GEAR, REV.	1	Z=51
12	N141410010	PLUG, DRIFICE	1	#1.0
13	N085712035	BOLT	8	#4
14	N140417000	PLUG	1	
15	N370172415	WASHER, COPPER	1	
16	N340712060	PIN, KNOCK	1	
17	N141413012	PLUG, DRIFICE	1	#1.2
18	N412006324	RING, SEAL	5	
19	N141410040	PLUG, DRIFICE	1	#4.0
20	N059A00700	RING, SNAP	1	
21	N46030A012	SHIM	1SET	
22	1-83192	BEARING, NEEDLE ROLLER	1	INNER
23	1-83256	SPRING, WAVE	1	
24	5A007014	CLUTCH GROUP	1	
25	22C013041	SHAFT, CLUTCH	1	
26	N141410000	PLUG	1	
27	N141410000	PLUG	1	
28	1-83189	BEARING, TAPERED ROLLER	1	
29	N141413016	PLUG, DRIFICE	1	#1.6
30	22B032237	COVER	1	
31	N421027300	RING, SNAP	1	
32	3-49761-B	PLATE, FRICTION	6	
33	3-49762	PLATE, STEEL	7	
34	1-8735-AW	RING, SQUARE	1	
35	N131007143	BALL	1	
36	1-5075-BJ	PLUG, DRIFICE	1	
37	22B032327	PLATE, BACK	1	
38	22A002658T	BOLT, EMERGENCY	6	
39	1-8735-F	RING, SQUARE	1	
40	5-51698-B	PISTON, CLUTCH	1	
41	N391010007	PLUG	1	

REV	BY	APPD.	REV	ZONE	CH. NO.	DATE	REV	ZONE	CH. NO.	DATE

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MATERIAL
-
HEAT TREAT
-
SURFACE TREATMENT

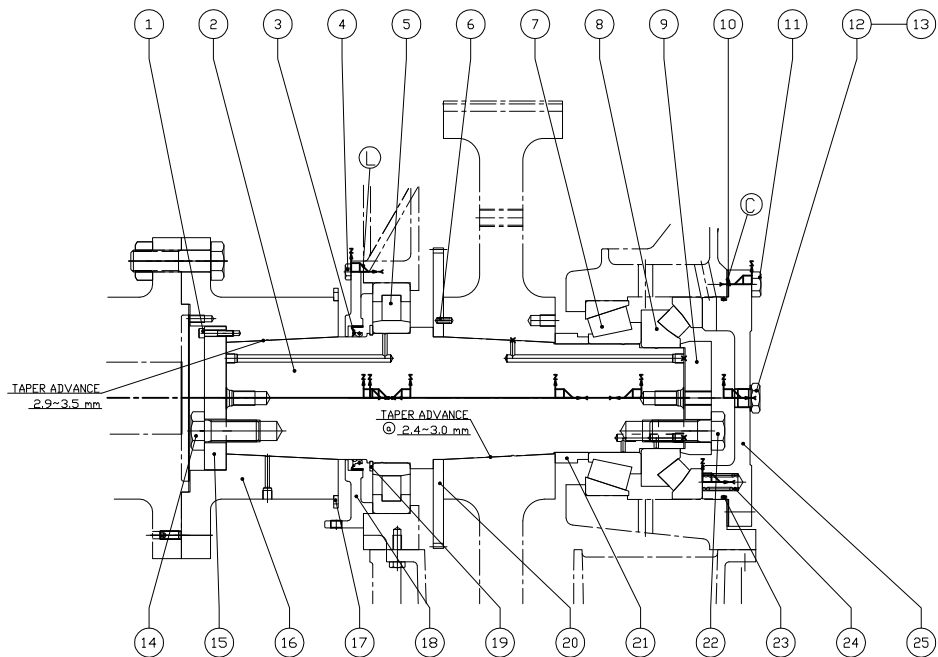
WSS
No
UR²
N.N.
FIRST USE
ASSY
MODEL MG-5506
NAME

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
MACHINED DIMENSIONS
2 X
X 25
X 25
X 13
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING
PER ANSI Y14.5M 1998

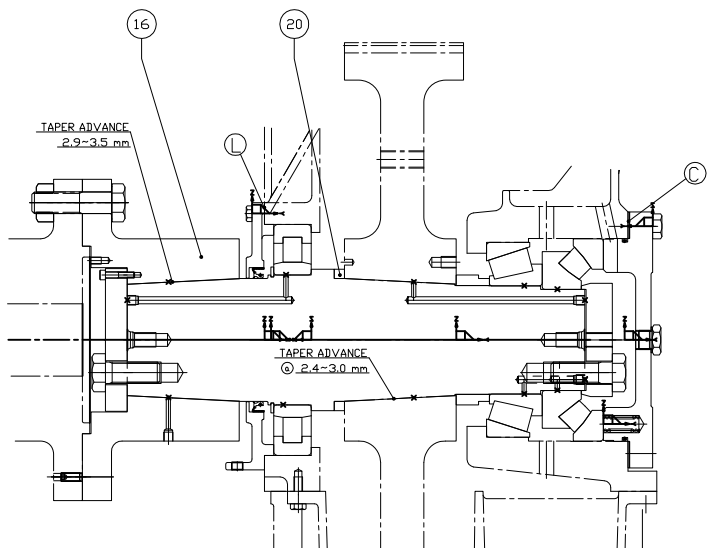
DATE 060105
SCALE 1:4
DRN
CHK
APPD.
N. Miya to
H. Tsunekawa
Y. Kaneko

TWIN DISC
I N C O R P O R A T E D
RACINE, WI 53403 - USA

00D005604-3
SHEET 1 OF 1
REV ---



OUTPUT SHAFT GROUP<STANDARD TYPE>
BOM No.2A021662



OUTPUT SHAFT GROUP W/O TRILING PUMP GEAR
BOM No.2A021662A

ITEM	PARTS NO.	N A M E	Q'TY	REMARKS
1	N113808040	BOLT, SOCKET HEAD	2	*2
2	22B032278	SHAFT, OUTPUT	1	
3	N408011700	SEAL, OIL	1	
4	N085712035	BOLT	12	*4
5	1-83194	BEARING, ROLLER	1	
6	SEE TABLE1	PIN, SPRING	6	
7	1-83190	BEARING, TAPERED ROLLER	1	
8	1-79017	BEARING, THRUST ROLLER	1	
9	22A022446J	DISC	1	
10	22A024886~	SHIM	1SET	
11	N085720060	BOLT	16	*6
12	N140427000	PLUG, SCREW	1	
13	N370263615	WASHER, COPPER	1	
14	N085730075	BOLT	3	*8
15	22A023083G	DISC	1	
16	SEE TABLE1	FLANGE, OUTPUT	1	
17	1-79375-K	GEAR, SENSOR	1	
18	3-54236	CARRIER, SEAL	1	
19	N059018000	RING, SNAP	1	
20	SEE TABLE1	GEAR, PUMP	1	
21	1-84037	WASHER	1	
22	N085730085	BOLT	3	*8
23	N048030048	RING-□	1	G-270
24	N050019077	SPRING	8	
25	22B032078	COVER	1	

TABLE 1

BOM No.	ITEM 16	ITEM 20	ITEM 6
2A021662	22B032279A	22B032223A	N075080018
2A021662A	22B032279	1-84012	---

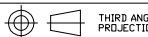
TABLE 2

MARKS	BOLT	TIGHTENING TORQUE
*1	M8x1.25	12.5 N·m
*2	M8x1.25	21.3 N·m
*3	M10x1.5	55.0 N·m
*4	M12x1.75	96.0 N·m
*5	M16x2	236 N·m
*6	M20x2.5	461 N·m
*7	M22x2.5	628 N·m
*8	M30x3.5	1581 N·m

NOTES

- 1.ADJUST SPACES◎FOR EACH SHAFT WITH SHIMS.
SPACES◎SHOULD BE 0 ~ 0.05 mm.
USE THICK SHIM(0VER 1mm) ON THE SIDE OF GROOVE IF THERE IS A GROOVE.
- 2.FIGURES IN THE DRAWING SHOW TIGHTENING TORQUE FOR MAIN IMPORTANT BOLTS.(SEE TABLE 2)
- 3.MARKED◎SHOWS SEAT PACKINGS.
- 4.COAT LIQUID PACKING ON THE PORTION MARKED◎AND ASSEMBLE THEM.

METRIC



THIRD ANGLE PROJECTION

SIMILAR TO

1

060105

SCALE 1:4

DRN: N.Miyaoka

CHK: Y.Kaneko

APPR: Y.Kaneko

TWIN DISC
INCORPORATED
RACINE, WI 53403 - USA

00D005604-4

SHEET 1 OF 1

REV. 0

REV	BY	APPD.
0	N.MIYATAHMEZUND	

REV	ZONE	CH. NO.	DATE
0	MG64832	060907	

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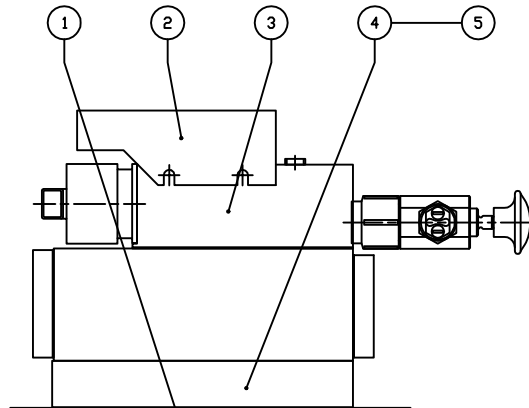
MATERIAL
-
HEAT TREAT
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SURFACE TREATMENT
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NAME
MG-5506

DATE
060105
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DRN
N.Miyaoka
CHK
Y.Kaneko
APPR
Y.Kaneko

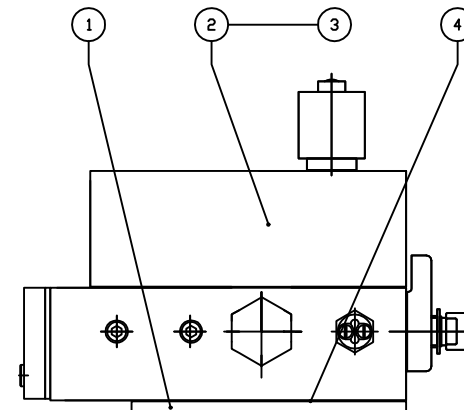
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DRN
N.Miyaoka
CHK
Y.Kaneko
APPR
Y.Kaneko

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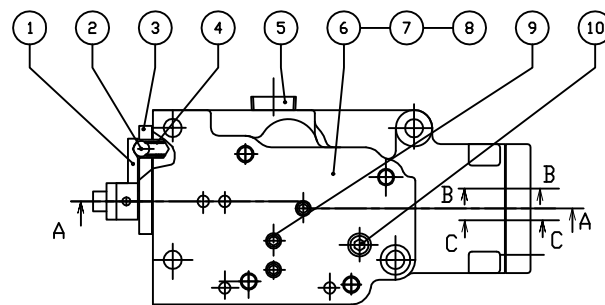
ITEM	PARTS NO.	N A M E	Q' TY	REMARKS
1	3-54261	GASKET	1	
2	J1020585A	CONTROLLER	1	
3	J1020941B	VALVE AS., SELECTOR	1	
4	3-54260	PLATE	1	
5	N113810065	BOLT, SOCKET HEAD	4	#3

CONTROL VALVE GROUP
1020941C PROFILE MODULE
BOM No. 2A021435

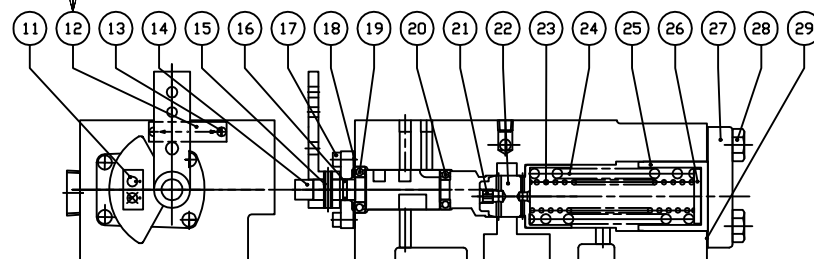
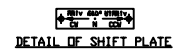


CONTROL VALVE GROUP
1018084P MECH BACK-UP W/O NEUT. SOL
BOM No. 2A017230B

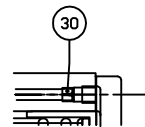
ITEM	PARTS NO.	N A M E	Q' TY	REMARKS
1	22A025467	PLATE	1	
2	J1018084P	VALVE, SELECTOR	1	
3	N113810145	BOLT, SOCKET HEAD	4	W3
4	J1017383	GASKET	2	



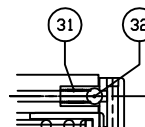
ITEM	PARTS NO.	N A M E	Q'TY	REMARKS
1	3-31780-F	LEVER	1	
2	N131009525	BALL, STEEL	1	
3	1-69195	BASE, PLATE	1	
4	JA2701AY	SPRING	1	
5	N389927000	PLUG, TAPER	1	
6	7-37341	BODY, VALVE	1	
7	N131007143	BALL, STEEL	9	
8	N391009006	PLUG	4	
9	221012373	PLUG, TAPER	3	
10	221012373A	PLUG, TAPER	1	
11	1-59840	PLATE, NAME	1	
12	1-13016-N	PLATE, NAME	1	
13	221015747	SCREW, DRIVE	2	
14	1-69746	STEM, VALVE	1	
15	N075050022	PIN, ROLL	1	
16	ND48002064	RING, 'O'	1	
17	N113805014	SCREW, SOCKET HEAD	4	
18	1-69196-F	GASKET	1	
19	N506902000	BEARING, BALL	1	
20	N506901000	BEARING, BALL	1	
21	N393080625	PLUG, SCREW	1	DRIFTC #2.5
22	1-78514-C	PISTON	1	
23	K175118039	SPRING	1	
24	K175030014	SPRING	1	
25	1-78515	PISTON	1	
26	1-78911	WASHER	1SET	
27	1-78516	COVER	1	
28	N085710030	SCREW, HEX HEAD	4	#3
29	1-78517	GASKET	1	
30	N393080608	PLUG, SCREW	1	DRIFTC #0.8
31	N175008019	SPRING	1	
32	N131009525	BALL, STEEL	1	



SECTION A - A



SECTION C - C



SECTION B - B

CONTROL VALVE GROUP
MANUAL VALVE
BOM No. 2A021260C

MARKS	BOLT	TIGHTENING TORQUE
■1	M8x1.25	12.5 N.m
■2	M8x1.25	21.3 N.m
■3	M10x1.5	55.0 N.m
■4	M12x1.75	96.0 N.m
■5	M16x2	236 N.m
■6	M20x2.5	461 N.m
■7	M22x2.5	628 N.m
■8	M30x3.5	1581 N.m

NOTES

1. FIGURES IN THE DRAWING SHOW TIGHTENING TORQUE FOR MAIN IMPORTANT BOLTS. (SEE TABLE 2)
2. MARKED (P) SHOWS SEAT PACKINGS.

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MATERIAL	-
HEAT TREAT	-
SURFACE TREATMENT	-

MASS	IN ³	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MACHINED DIMENSIONS X .0075 X X .0025 X XX .01 ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.3M 1992
kg	liters	
FIRST USE ASSY.	MODEL MG-5506	
NAME	MG-5506	MARINE TRANSMISSION

DATE	060105	TWIN DISC INCORPORATED RACINE, WI 53403 - USA	1
SCALE	1:2		
DRAWN	N. Miyata		
CHECKED	H. Tsunekawa		
APPROVED	Y. Koneko		
		00D005604-7	
		SHEET 1 OF 1	REV

6

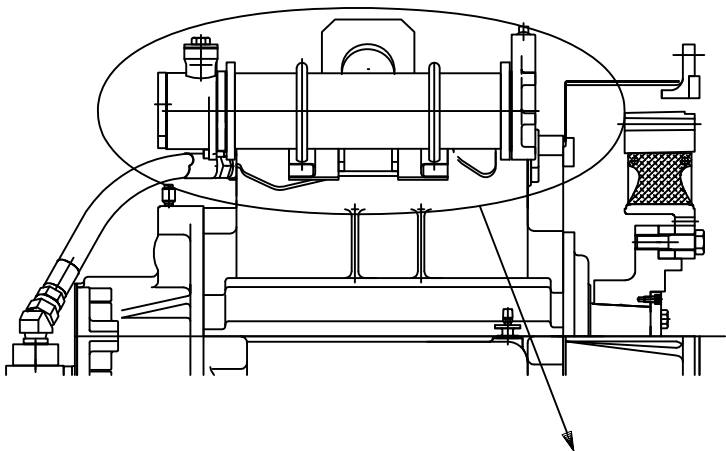
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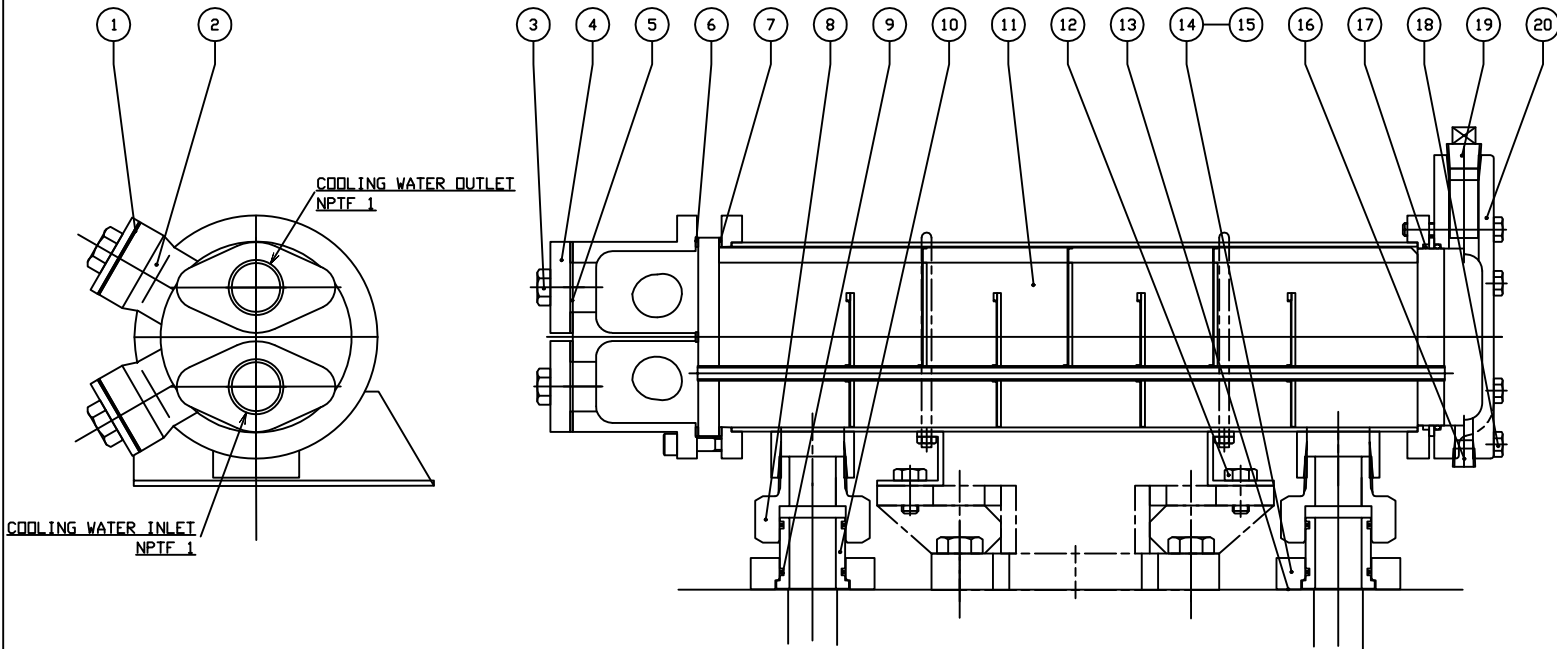
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2

1



ITEM	PARTS NO.	N A M E	Q' TY	REMARKS
P 1	221041657	GASKET	2	INCLUDE ITEM 11
2	1-63760-E	ZINC, ANTI-CORROSIVE	2	INCLUDE ITEM 11
3	N085512030	BOLT	4	#4
4	1-51819-M	FLANGE	2	
P 5	1-64583-A	GASKET	2	INCLUDE ITEM 11
P 6	1-63573-K	GASKET	1	INCLUDE ITEM 11
P 7	1-63572-Y	GASKET	1	INCLUDE ITEM 11
8	1-56240-AX	BUSH	2	
9	N048004036	RING, O	4	
10	1-58169-V	PIPE, CONNECTING	2	
11	3-49199-B	HEAT EXCHANGER ASS'Y	1	
12	N085710020	BOLT	4	#3
P 13	N074007541	GASKET	2	
14	1-83297	FLANGE	2	
15	N113812025	BOLT, SOCKET HEAD	4	#4
16	1-80389	PLUG, TAPER	1	
17	1-63762-A	O-RING	2	
18	N085708055	BOLT	6	#2
19	1-55034	ZINC, ANTI-CORROSIVE	2	
20	3-54301	COVER, HEAT EXCHANG	1	



HEAT EXCHANGER OPTION
MOUNTED RAW WATER HEAT EXCHANGER
BOM No. 2A021261

COOLING WATER INLET
NPTF 1

COOLING WATER OUTLET
NPTF 1

TABLE 2		
MARKS	BOLT	TIGHTENING TORQUE
#1	M8x1.25	12.5 N·m
#2	M8x1.25	21.3 N·m
#3	M10x1.5	55.0 N·m
#4	M12x1.75	96.0 N·m
#5	M16x2	236 N·m
#6	M20x2.5	461 N·m
#7	M22x2.5	628 N·m
#8	M30x3.5	1581 N·m

NOTES
1. FIGURES IN THE DRAWING SHOW TIGHTENING TORQUE FOR
MAIN IMPORTANT BOLTS. (SEE TABLE 2)
2. MARKED (P) SHOWS SEAT PACKINGS.

REV	BY	APPD.	REV	ZONE	CH. NO.	DATE	REV	ZONE	CH. NO.	DATE

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MATERIAL
-
HEAT TREAT
-
SURFACE TREATMENT

NAME
MG-5506

DATE
060105

SCALE
1:5

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN
MILLIMETERS
2.5 30.25 30.25 30.25
2.5X 30.25 30.25 30.25
ALL ANGULAR TOLERANCES ±1°
GEOMETRIC TOLERANCING
PER ANSI Y14.5M 1994

DATE
060105

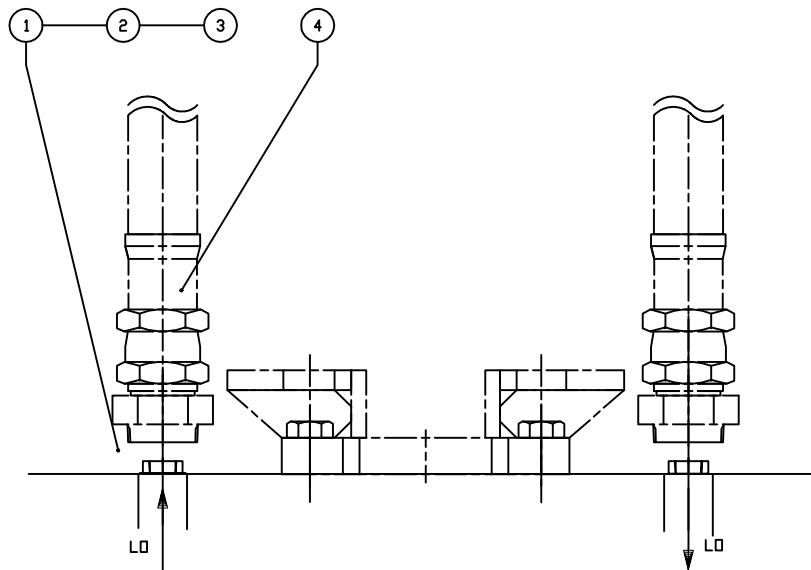
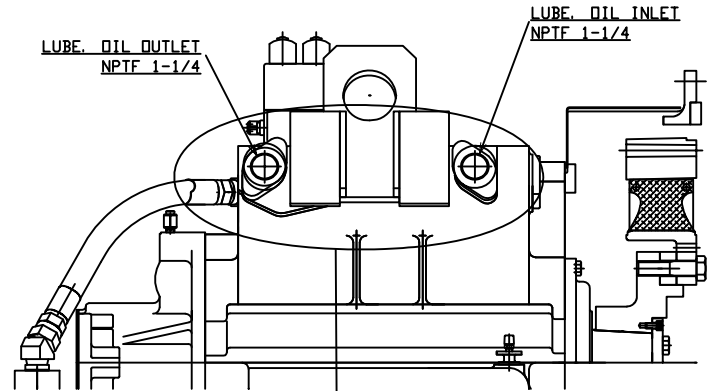
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METRIC
THIRD ANGLE
PROJECTION
SIMILAR TO

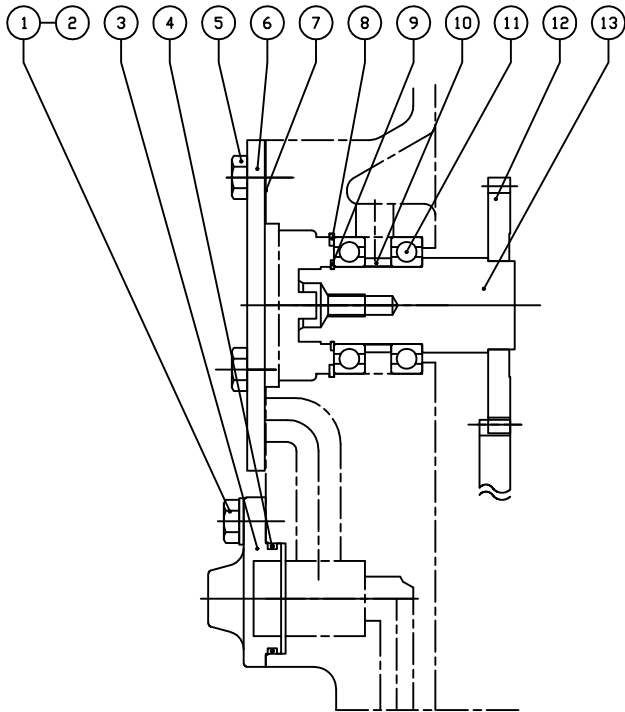
TWIN DISC
INCORPORATED
RACINE, WI 53403 - USA

00D005604-8
SHEET 1 OF 1
REV ---

ITEM	PARTS NO.	N A M E	Q' TY	REMARKS
1	22A023774A	FLANGE	2	NPTF 1-1/4
P 2	N074207541	GASKET	2	
3	N085512045	BOLT	4	#4
4	---	HOSE, RUBBER	2	SUPPLIED BY CUSTOMER

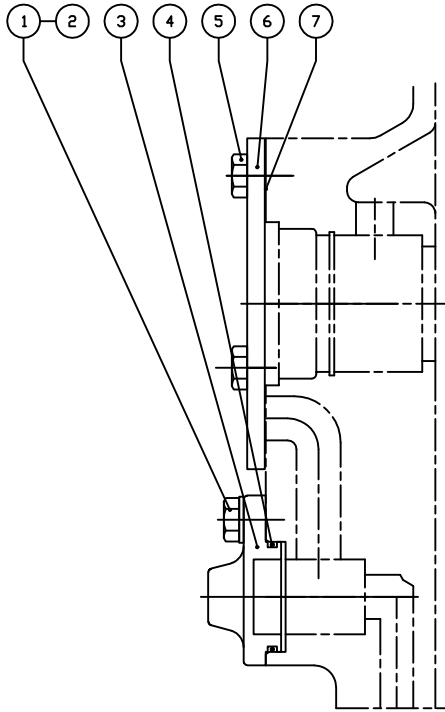


HEAT EXCHANGER OPTION
ADAPTER FOR CUSTOMER SUPPLIED HEAT EXCHANGER
(CUSTOMER SUPPLY HEAT EXCHANGER)
BOM No. 2A021261A



ITEM	PARTS NO.	N A M E	Q' TY	REMARKS
1	N085710030	BOLT	2	#3
2	N031010000	WASHER	2	
3	1-68614-A	COVER, STRAINER	1	
4	N048006043	RING, O	1	G-45
5	N085710025	BOLT	6	#3
6	1-74225	COVER	1	
7	1-58433-A	GASKET	1	
8	N058006200	RING, SNAP	1	
9	N059003500	RING, SNAP	1	
10	K330050121	WASHER	1	
11	N506007H00	BEARING, BALL	2	
12	228032224	GEAR, PUMP	1	
13	3-45161-G	SHAFT, PUMP	1	

TRAILING PUMP OPTION
W/ TRAILING PUMP DRIVER
BOM No. 2A021264A



ITEM	PARTS NO.	N A M E	Q' TY	REMARKS
1	N085710030	BOLT	2	#3
2	N031010000	WASHER	2	
3	1-68614-A	COVER, STRAINER	1	
4	N048006043	RING, O	1	G-45
5	N085710025	BOLT	6	#3
6	1-74225	COVER	1	
7	1-58433-A	GASKET	1	

TRAILING PUMP OPTION
W/O TRAILING PUMP DRIVER
BOM No. 2A021264

MARKS	BOLT	TIGHTENING TORQUE
#1	M8x1.25	12.5 N.m
#2	M8x1.25	21.3 N.m
#3	M10x1.5	55.0 N.m
#4	M12x1.75	96.0 N.m
#5	M16x2	236 N.m
#6	M20x2.5	461 N.m
#7	M22x2.5	628 N.m
#8	M30x3.5	1581 N.m

NOTES
1. FIGURES IN THE DRAWING SHOW TIGHTENING TORQUE FOR MAIN IMPORTANT BOLTS. (SEE TABLE 2)
2. MARKED (P) SHOWS SEAT PACKINGS.

REV	BY	APPD.	REV	ZONE	CH. NO.	DATE	REV	ZONE	CH. NO.	DATE

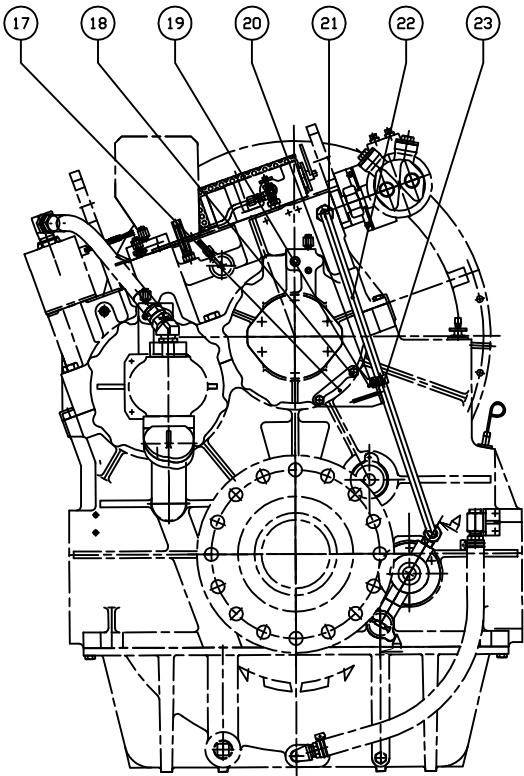
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MATERIAL	WASS	UR ¹
HEAT TREAT	ASSY.	NAME
SURFACE TREATMENT	MODEL MG-5506	NAME

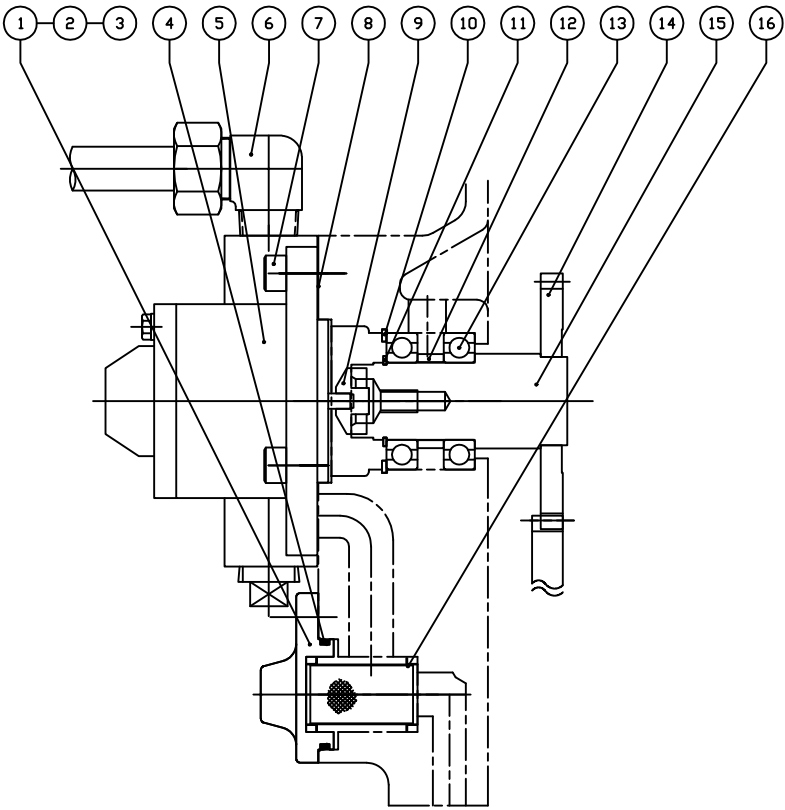
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS	DATE	060105
MACHINED DIMENSIONS	SCALE	1:1.5
2 X .75	DRN	N. Miyasato
2 X .25	CHK	H. Tsunekawa
2 X .13	APPD.	Y. Kaneko
ALL ANGULAR TOLERANCES ±1°		
GEOMETRIC TOLERANCES ±1°		
PER ANSI Y14.5M 1998		

TWIN DISC INCORPORATED RACINE, WI 53403 - USA	00D005604-9 SHEET 1 OF 1 REV ---
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ITEM	PARTS NO.	N A M E	Q' TY	REMARKS
1	1-68614-A	COVER, STRAINER	1	
2	N085710030	BOLT	2	#3
3	N031010000	WASHER	2	
4	N048006043	RING, O	1	G-45
5	3-30763-B	PUMP, TRAILING	1	
6	B810113851	ELBOW	1	
7	N113810030	BOLT, SOCKET HEAD	6	#3
8	1-58433-A	GASKET	1	
9	1-13304-A	COUPLING, OLDHAM'S	1	
10	N058006200	RING, SNAP	1	
11	N059003500	RING, SNAP	1	
12	K330050121	WASHER	1	
13	N506007H00	BEARING, BALL	2	
14	228032224	GEAR, PUMP	1	
15	3-45161-G	SHAFT, PUMP	1	
16	1-54942	STRAINER	1	
17	1-84076	BRACKET	1	
18	N085712045	BOLT	2	#4
19	N085510020	BOLT	1	#3
20	N089411000	NUT	1	
21	B81011384J	CONNECTOR	1	
22	22A025545	PIPING	1	20A
23	221109042P	PLATE, STEADY REST	1	



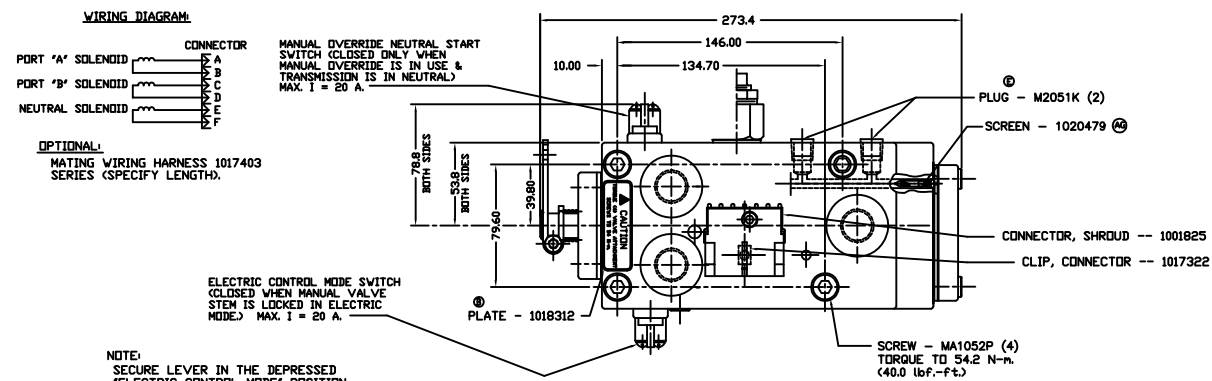
SEEING FROM STERN



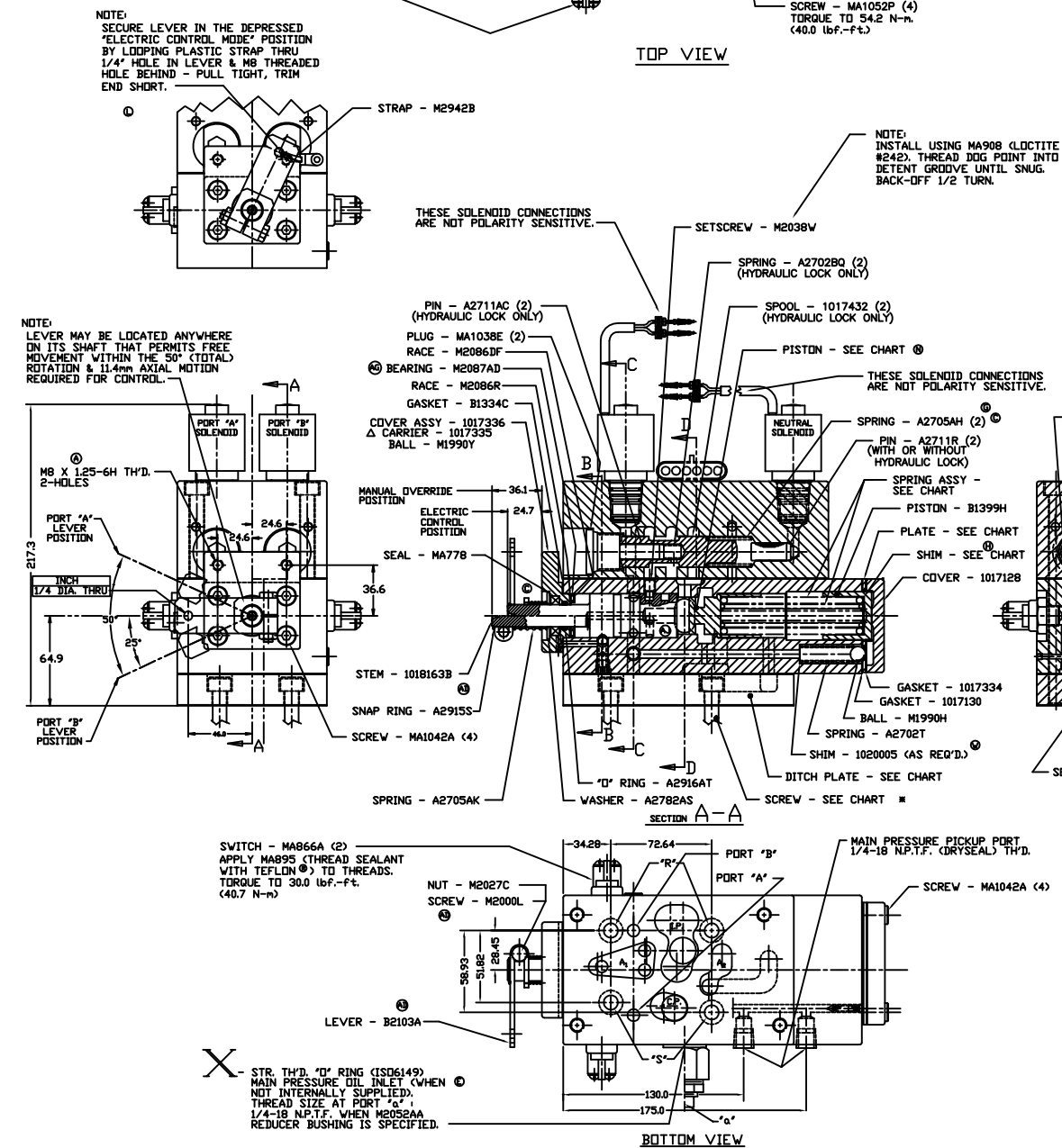
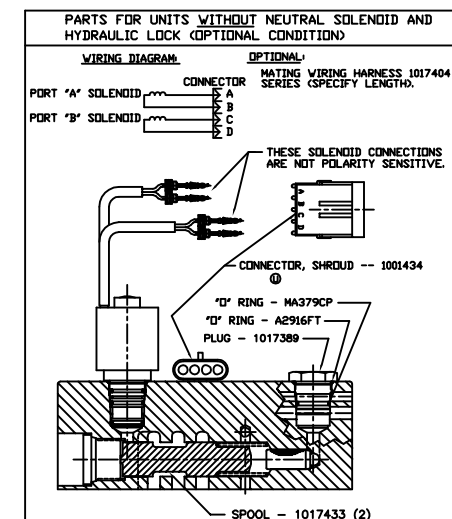
SECTION A-A

TRAILING PUMP OPTION
W/ TRAILING PUMP
BOM No. 2A021264B

METRIC
THIRD ANGLE
PROJECTION
SIMILAR TO



SEE SHEET 2 OF 2 FOR VALVE ASSEMBLIES



NOTE:
INSTALL USING MA908 (LOCTITE
#242) TOP OF SCREW MUST BE
FLUSH WITH SURFACE.

Ⓐ ☐ OBSOLETE FOR PRODUCTION
AND SERVICE

△ NOT SERVICEABLE SEPARATELY

* THESE PARTS ARE TO BE PACKAGED SEPARATELY AND SHIPPED WITH UNIT.

A₁ = ATMOSPHERIC PRESSURE
A₂ = ATMOSPHERIC PRESSURE
I.P. = INTERMEDIATE PRESSURE
C.P. = CLUTCH PRESSURE

HYDRAULIC DIAGRAM A7119W, SHEET 1 OF 2 1

										AJ	1		ECN11238	12-20-02	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS SEE THE DRAWING FOR TOLERANCES UNLESS OTHERWISE SPECIFIED ALL ANGLES TOLERANCES ±1° GEOMETRIC TOLERANCING UNLESS OTHERWISE SPECIFIED	WEIGHT	VOLUME	FIRST USE NO. 1015007 MODEL NO. 5202DC	
										AG	2		ECN0970	8-9-02					
										AH	2		ECN0415	1-11-02					
										AF	2		ECN10553	12-31-01					
AL	2		ECN12514	6-23-04	AG	2		ECN0415	1-11-02										
AK	2		ECN1492	5-28-03	AF	2		ECN10553	12-31-01										
REV	SHEET	ZONE	CH. NO.	DATE	REV	SHEET	ZONE	CH. NO.	DATE										

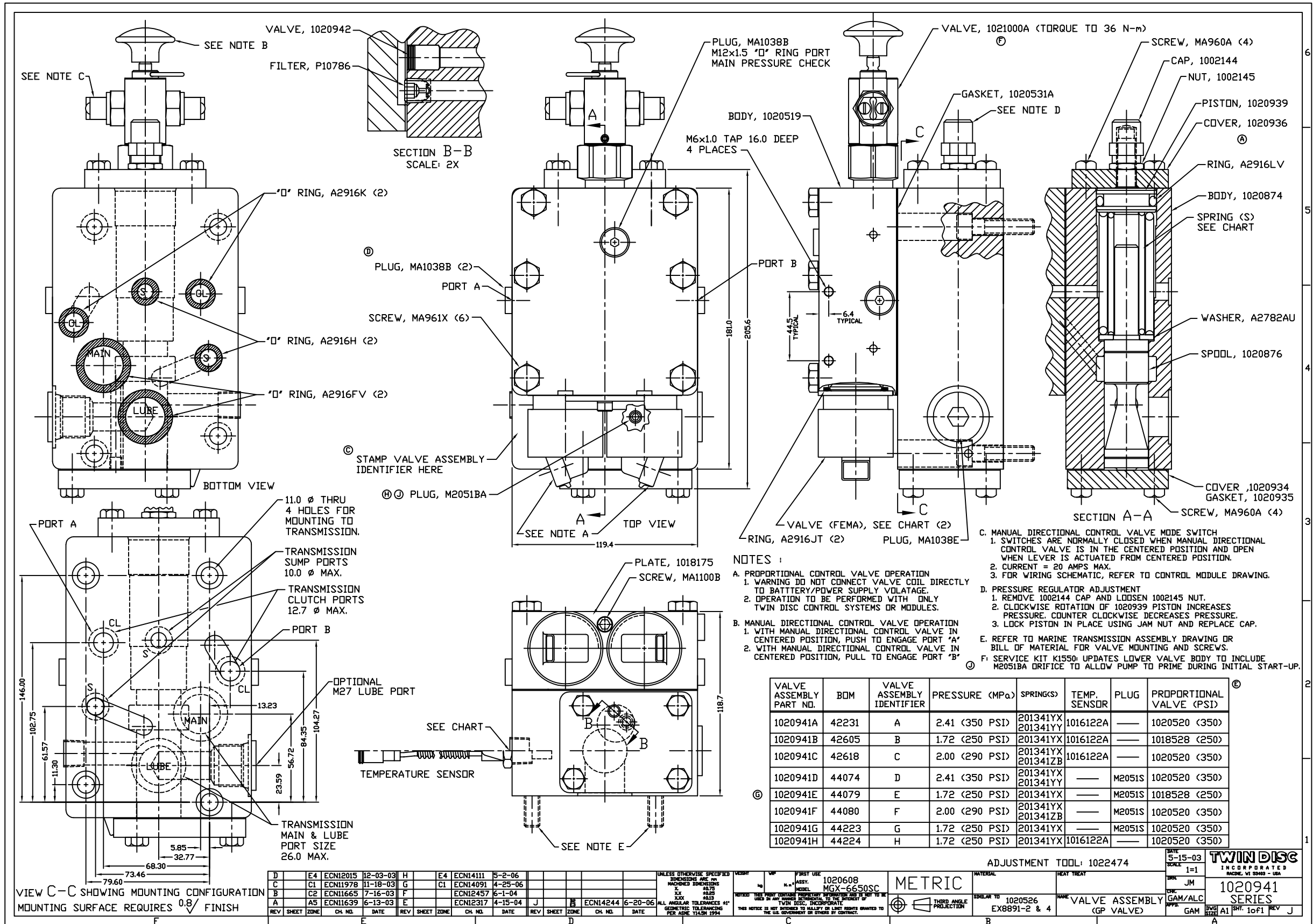
METRIC

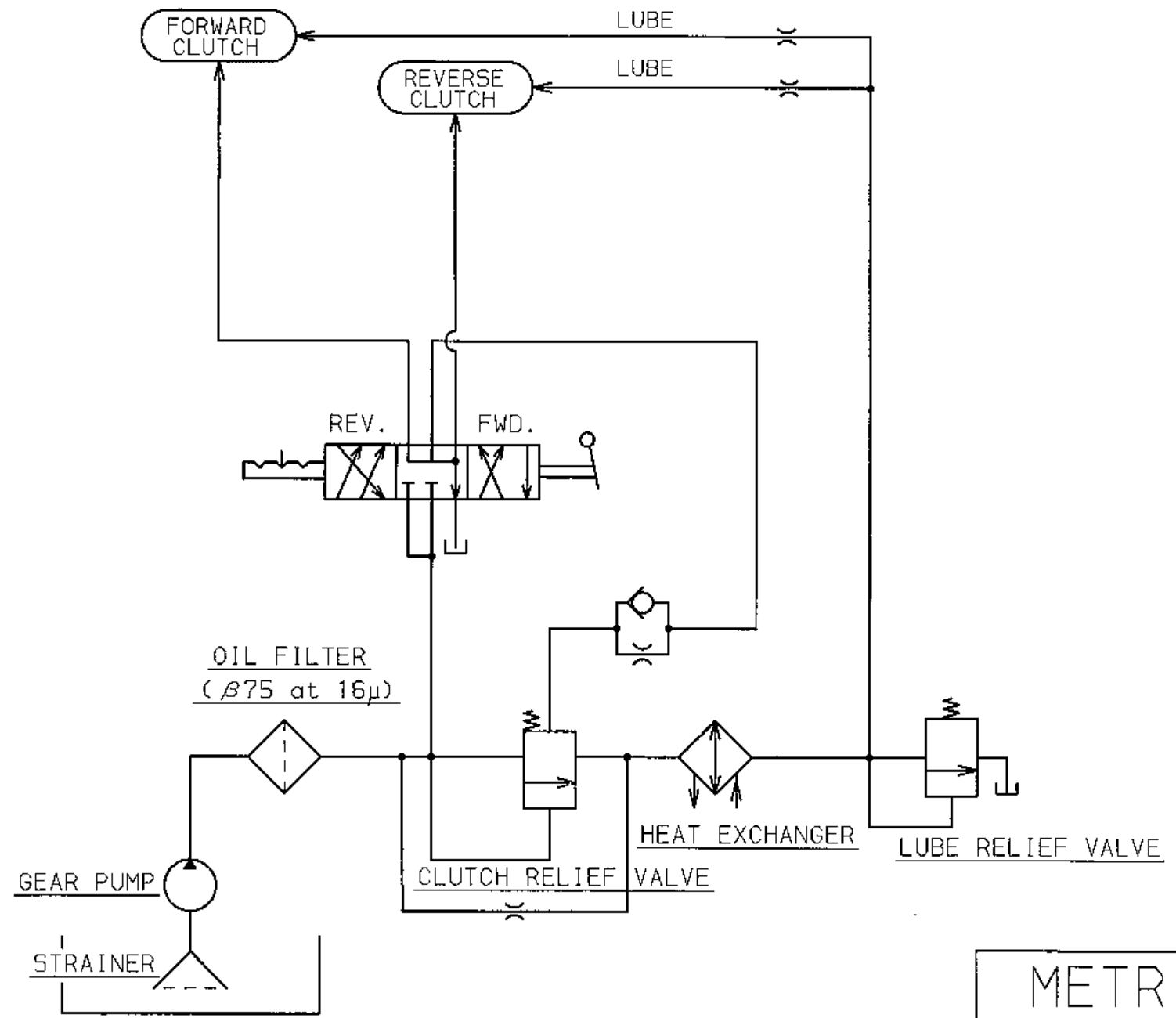


MATERIAL	-----
SIMILAR TO	

HEAT TREAT	-----
NAME	VALVE ASS'Y. - CONTROL (WITHOUT TROLLING VALVE)

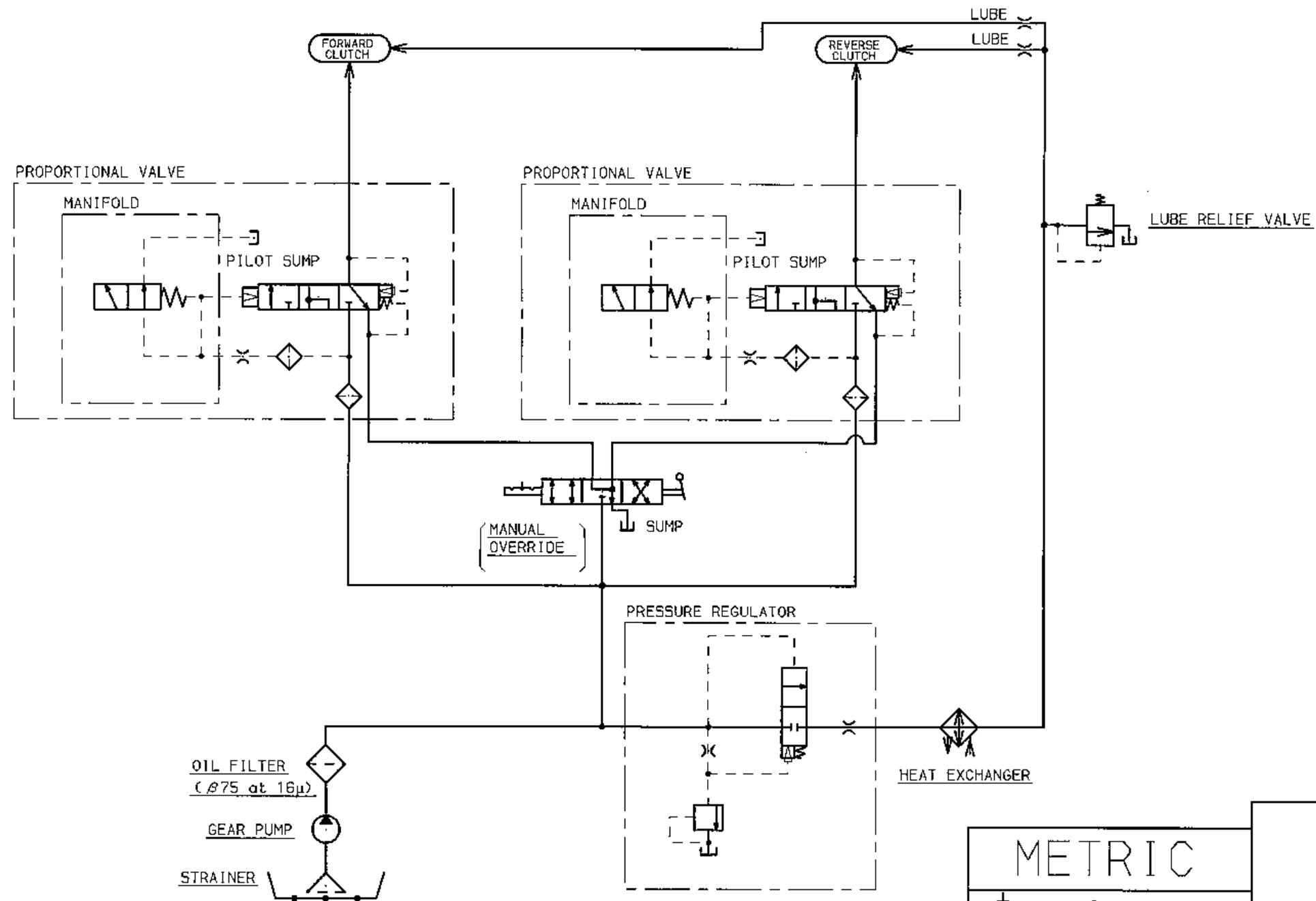
DATE 3-23-98		TWIN DISC INCORPORATED RACINE, WI 53403 - USA			
:50 = 1.00		1018084 SERIES			
DRAL	RM				
CHIC	RM/BJE				
APPL	DAS	DWG	SHT.	1 OF 2	REV AL





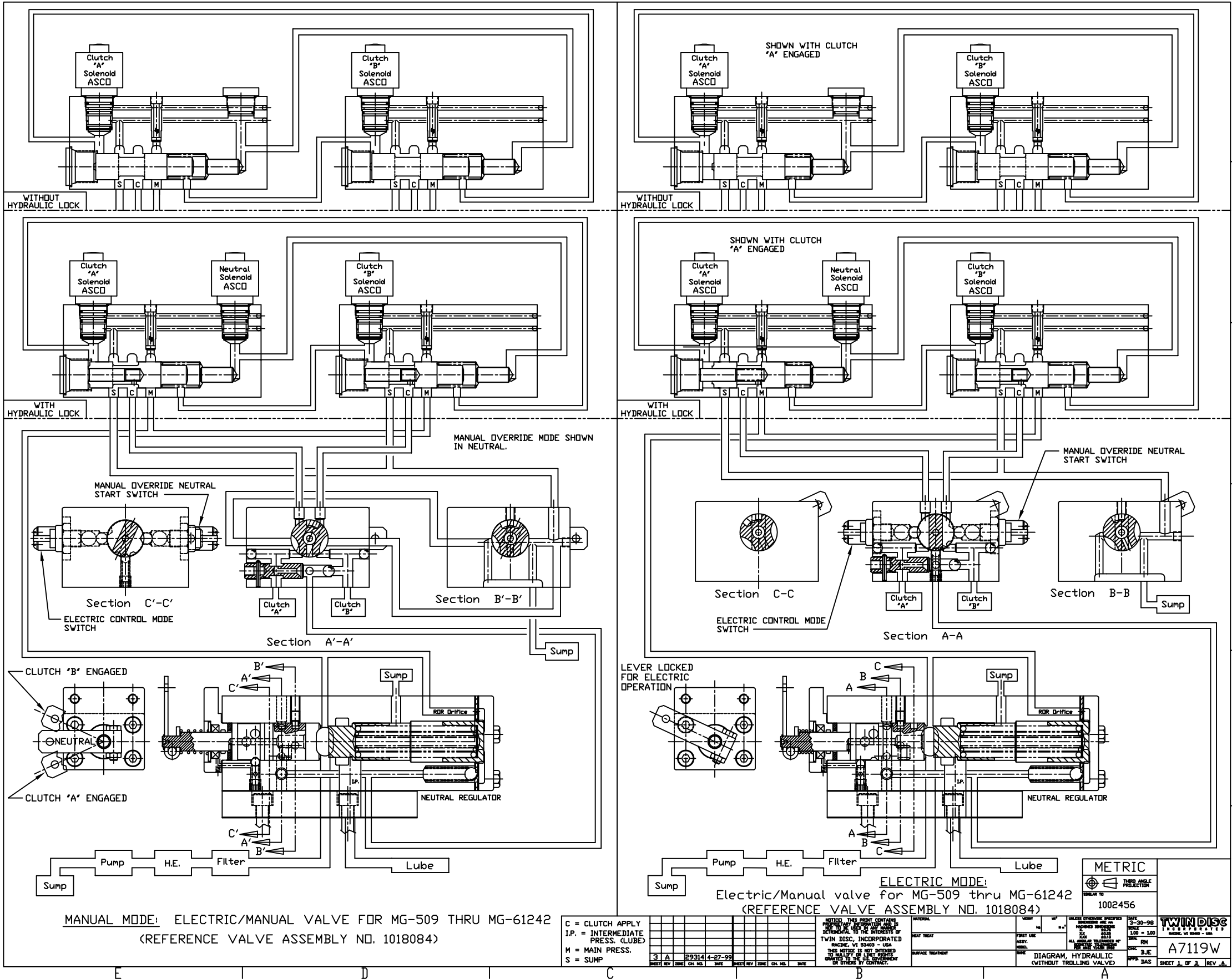
REV	BY	APPD.

*****	*****	*****	*****	*****	*****	SIMILAR TO NOTICE: THIS PRINT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF TWIN DISC, INCORPORATED RACINE, WI 53403 - USA THIS NOTICE IS NOT INTENDED TO NULLIFY OR LIMIT RIGHTS GRANTED TO THE U.S. GOVERNMENT OR OTHERS BY CONTRACT.	MATERIAL -	Mass XXXX kg	WR ² N·m ²	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm MACHINED DIMENSIONS X. ±0.75 X.X ±0.25 X.XX ±0.13 ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1982	DATE 031030	TWIN DISC INCORPORATED RACINE, WI 53403 - USA		
*****	*****	*****	*****	*****	HEAT TREAT - -		FIRST USE ASSY. MODEL MG-5506	SCALE 1:1	DRN. d.yagi					
*****	*****	*****	*****	*****	SURFACE TREATMENT		NAME HYDRAULIC DIAGRAM	CHK. K.Schuchter						
*****	*****	*****	*****	*****					APPD. K.Schuchter	3-54650				
REV	CH. NO.	DATE	REV	CH. NO.	DATE						SHEET 1 OF 1		REV	



REV	BY	APPD.

*****	*****	*****	*****	*****	*****	SIMILAR TO	MATERIAL	Mase	MR ³	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE mm MACHINED DIMENSIONS X. ±0.75 X.X ±0.25 X.XX ±0.13 ALL ANGULAR TOLERANCES ±1° GEOMETRIC TOLERANCING PER ANSI Y14.5M 1992	DATE 031030	TWIN DISC INCORPORATED RACINE, WI 53403 - USA 3-54650-A SHEET 1 OF 1 REV ____
*****	*****	*****	*****	*****	*****	NOTICE: THIS PRINT CONTAINS PROPRIETARY INFORMATION AND IS NOT TO BE USED IN ANY MANNER DETRIMENTAL TO THE INTERESTS OF TWIN DISC, INCORPORATED RACINE, WI 53403 - USA THIS NOTICE IS NOT INTENDED TO WAIVE OR LIMIT RIGHTS GRANTED TO THE U.S. GOVERNMENT OR OTHERS BY CONTRACT.	HEAT TREAT	XXXX kg	N·m ²	FIRST USE ASSY. MODEL MG-5506	SCALE 1:1	
*****	*****	*****	*****	*****	*****					NAME	DRN. a.yagi	
*****	*****	*****	*****	*****	*****					HYDRAULIC DIAGRAM	CHK. K.Sakaguchi	
*****	*****	*****	*****	*****	*****						APPD. K.Sakaguchi	
REV	CH. NO.	DATE	REV	CH. NO.	DATE							



MANUAL MODE: ELECTRIC/MANUAL VALVE FOR MG-509 THRU MG-61242
(REFERENCE VALVE ASSEMBLY NO. 1018084)

C = CLUTCH APPLY
I.P. = INTERMEDIATE
PRESS. (LUBE)
M = MAIN PRESS.
S = SUMP

SHEET NO.	REV.	DATE	BY	CHK.	DATE
3	A	1993-11-14	4-27-99		

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INQUIRY: 410-2440 - USA
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OR OTHERS BY CONTRACT.

INTERNAL
HEAT TREAT
SURFACE TREATMENT

UNIT: mm
FIRST USE: 11/93
MODEL: 1002456
DATE: 11/93

METRIC
TWIN DISC
INCORPORATED
A7119W
SHEET 1 OF 3 REV. A

